

Pioneer Trail Research Report

Bird-Truax Trail of 1866

Nicholson Profile & Map Analysis

Analysis of G. B. Nicholson's Maps of the Northern Nez Perces Trail

SECOND EDITION (Reprint)

by

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May 23, 1996 (Reprint October 28, 2015)

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**PIONEER TRAIL RESEARCH
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Preface to the Reprint Edition

George Benson Nicholson was the civil engineer for the survey of the Virginia City and Lewiston Wagon Road project in 1866. Nicholson did two surveys, a course and distance survey of the Northern Nez Perces Trail (NNT) and a stake and chain survey for the wagon road survey. His survey of the NNT between Lolo, Montana and Green Saddle, Idaho was along the same trail followed by Lewis and Clark, except for a minor deviation between Moon Saddle and Indian Postoffice.

At the time of this research, the records of these surveys were unavailable to me because I was unaware of their existence and did not look for them. All I had was the maps that Nicholson had provided Reuben Thwaites for his 1905 edition of the Lewis and Clark Journals. Nicholson's maps did not cover the Hungery Creek route nor the Powell Ranger Station route because a survey of them was not necessary for the wagon road.

The Nicholson maps were a rich resource for me in the early days of my research because his map collection also included a distance and barometric elevation profile for the Lolo Trail. This report covers my analysis of that data that would produce my first-ever estimation of the location of the trail that was independent of the U. S. Forest Service visitor maps of those years. It turned out to be valuable to my field work and to the correct trail placement in locations where there were no other records except for the L&C Journals.

The problem with barometric elevation data is that it depends on the weather remaining stable during the survey. If a high-pressure or low-pressure weather front passes, it can distort the measurements. For this reason, I did an linear-regression, statistical analysis of the data to correct for atmospheric baseline pressure changes. It was very successful.

I also considered doing an N-point, three dimensional, least-squares curve fit to the data in order to have a computer plot the best estimate of the trail location on topographic maps. I did not do the computer programming needed to do this because the linear-regression method had provided such good results.

Using this method, I prepared maps of Nicholson's version of the Lolo Trail and began using them in my future 'office research' and 'field research.'

My approach to historic trail research for the Lewis and Clark Trail is to find the location of the trail and then determine the location of the campsites by statistical inference and field explorations. This method has been very successful and has created better campsite location estimation that has been achieved by other researchers.

I have added the final table of corrected data for the Nicholson elevation profile to this report. It was inadvertently left out of the second edition report.

Steve F. Russell
October 28, 2015
Ames, Iowa

The following spreadsheet pages of the final table of corrected data for the Nicholson elevation profile have been added to the Reprint Edition.

Final Table of Corrected Data for the Nicholson Elevation Profile, Lolo Trail, 1866

Northern Nez Perces Trail - 1866

Nicholson Final Research Data for Distances

This is a master list of distances and locations along the Northern Nez Perces Trail as compiled in an elevation map by George B. Nicholson. Determined or certain locations are marked with the * symbol.

Column-1 is the reference number assigned to all geographic references from the documents by George B. Nicholson.

Column-2 is the raw, uncorrected distance data from the Nicholson documents.

Column-3 is the raw, uncorrected elevation data from the Nicholson documents.

Column-4 is the Nicholson data corrected for gross errors. This distances given are computed from Weippe Prairie.

Column-5 is the topo mileages starting at Weippe Prairie.

Column-6 is the topo elevations for all the reference points.

Column-8 is the reference name given to all of the reference points.

GBN REF NO.	GBN Raw Distance	GBN Raw Elev.	GBN Corrected MILES	TOPO FROM WEIPPE PRAIRIE	TOPO ELEV FEET	REFERENCE NAME
0			0.0	0.00		Weippe Prairie 3007
1	0.00	3228	3.0	2.80	3060	Heywood Meadows 3088
2	0.70	3232	3.7	3.35	3120	inflect up
3	1.05	3240	4.1	3.85	3320	inflect up
4	1.50	3350	4.5	4.15	3410	inf down
5	1.80	3370	4.8	4.30	3445	Browns Creek Saddle 3396
6	2.70	3240	5.7	5.50	3195	dip
7	3.05	3300	6.1	5.65	3235	peak
8	3.40	3260	6.4	5.85	3205	dip
9	3.75	3280	6.8	6.00	3220	peak
10	4.00	3230	7.0	6.15	3185	dip
11	4.60	3310	7.6	6.25	3195	peak
12	7.25	3245	10.3	9.05	3140	shallow dip (Small Prairie)
13	10.00	3367	13.0	10.85	3180	Musselshell Prairie 3182
14	10.60	3367	13.6	11.45	3187	* Musselshell Cr. Crossing
15	11.00	3600	14.0	11.90	3395	infl down
16	11.20	3610	14.2	12.15	3450	shallow peak
17	11.30	3570	14.3	12.30	3424	shallow dip 3424
18	12.15	3750	15.2	13.10	3646	peak 3646
19	12.30	3680	15.3	13.30	3590	dip
20	12.80	3750	15.8	13.40	3640	inflect down
21	13.40	3770	16.4	13.65	3690	peak
22	13.45	3750	16.5	13.70	3660	small dip
23	14.50	3830	17.5	14.15	3725	peak
24	15.15	3620	18.2	14.65	3445	Siberia Creek
25	15.60	3820	18.6	14.80	3680	inflect down
26	16.15	3920	19.2	14.95	3725	peak
27	16.40	3800	19.4	15.05	3680	inflect up
28	17.00	3680	20.0	15.35	3395	Dutchman Creek
29	17.25	3730	20.3	15.50	3500	strange peak!
30	18.00	3600	21.0	15.95	3389	* Lolo Forks 3389
31	19.10	3900	22.1	16.25	3740	inflect up

Final Table of Corrected Data for the Nicholson Elevation Profile, Lolo Trail, 1866

32	19.95	4270	23.0	17.35	4251	inflect down 4251	
33	30.00	4659	26.6	20.15	4871	Ridge Camp (Cold Spring)	
34	30.95	4860	27.5	20.70	4780	inflect up	
35	31.10	4940	27.7	20.95	5000	inflect down	
36	32.45	5210	29.0	21.75	5340	* peak	
37	32.75	5140	29.3	21.94	5144	* Camp Martin 5144	
38	33.85	5944	30.4	22.95	6040	Snowy Summit	
39	35.45	5890	32.0	24.05	6020	inflect down	
40	36.85	5360	33.4	25.15	5302	* Beaver Dam Saddle 5302	
41	37.90	6015	34.5	26.05	5914	inflect, Squirrel Mtn 5914	
42	40.00	6220	36.6	27.55	6235	Squirrel Mtn. 6257	
43	40.30	5900	36.9	28.35	5840	dip (runs south)	
44	40.95	6200	37.5	28.65	6140	peak	
45	43.95	5490	39.3	30.00	5385	Little Weitas Creek 5412	
46	45.80	5880	41.1	31.05	5805	peak (near Butte Camp)	
47	47.00	5750	42.3	32.05	5420	* Green Saddle	
48	48.50	6532	43.8	33.15	6365	* Bowl Butte 6365	
49	50.30	5420	45.6	34.50	5027	* Deep Saddle 5027	
50	51.65	6616	47.0	35.40	6200	* Willow Ridge 6481	
51	52.50	6300	47.8	36.30	5801	* inflect down	
52	54.20	5110	49.5	37.15	4737	* Sherman Saddle	
53	55.35	5960	50.7	38.00	5725	inflect down 5725	
54	56.20	6250	51.5	38.45	6090	inflect down 6090	
55	56.80	6390	52.1	38.95	6230	peak 6230	
56	56.90	6330	52.2	39.05	6130	* dip	
57	57.65	6530	53.0	39.70	6320	Ridge NE of Sherman Peak	
58	58.10	6230	53.4	39.95	6020	inflect up	
59	58.55	6120	53.9	40.30	5890	* No-See-Um Meadows 5890	
60	59.00	6570	54.3	40.80	6270	* sharp peak	
61	59.25	6400	54.6	41.35	6010	* inflect up	
62	59.65	6290	55.0	41.70	5894	* saddle 5894	
63	60.20	6370	55.5	42.20	6050	inflect up	
64	60.50	6510	55.8	42.50	6130	sharp peak	
65	60.95	6260	56.3	43.05	5860	Saddle	
66	62.60	6528	57.9	44.65	6300	Bald Mountain	
67	63.80	6140	59.1	45.50	5782	* saddle 5782	
68	64.60	6400	59.9	46.20	6066	inflect down 6066	
69	65.25	6560	60.6	46.40	6220	inflect down	
70	66.50	6590	61.8	46.85	6276	small peak 6276	
71	66.80	6530	62.1	47.05	6180	small dip	
72	67.40	6740	62.7	47.95	6500	inflect level	
73	67.80	6740	63.1	48.25	6500	inflect up	
74	67.95	6780	63.3	48.40	6555	inflect level 6555	
75	68.30	6780	63.6	48.80	6554	inflect down 6554	
76	68.45	6580	63.8	49.15	6340	Saddle	
77	69.40	6770	64.7	49.90	6592	Castle Rock 6592	
78	69.70	6580	65.0	50.20	6370	* saddle	
79	70.20	6760	65.5	50.55	6574	Smoking Place 6574	
80	70.50	6600	65.8	50.80	6410	inflect up	
81	71.10	6500	66.4	51.40	6280	* Indian Grave Camp	
82	71.40	6590	66.7	51.55	6370	small peak	

Final Table of Corrected Data for the Nicholson Elevation Profile, Lolo Trail, 1866

83	71.60	6300	66.9	52.00	5980	Sinque Hole	
84	72.40	6520	67.7	52.50	6279	peak 6279	
85	72.90	6200	68.2	52.75	5870	* Saddle	
86	73.20	6370	68.5	53.00	6099	peak 6099	
87	73.70	6180	69.0	53.45	5860	inflect down	
88	73.90	5900	69.2	54.00	5634	inflect up 5634	
89	75.60	5160	70.9	55.50	4570	Serpent Creek (Snow Bridge) Gulch	
89	75.60	5160	70.9	55.50	4570	Serpent Creek (Snow Bridge) Gulch	
90	77.15	6100	72.5	57.40	6240	inflect down	
91	78.10	6270	73.4	58.00	6390	Moccasin Peak (at saddle)	
92	78.50	5920	73.8	58.60	6090	Howard Camp (Meadow)	
93	79.10	6160	74.4	58.90	6308	peak 6308	
94	79.50	6080	74.8	59.10	6230	saddle between	
95	80.05	6440	75.4	59.50	6635	peak 6635	
96	80.30	6330	75.6	59.70	6490	saddle	
97	80.75	6440	76.1	59.85	6658	peak 6658	
98	81.20	6280	76.5	60.50	6441	* saddle 6441	
99	81.55	6480	76.9	60.70	6620	inflect down	
100	81.75	6530	77.1	60.95	6673	peak 6773	
101	82.45	5950	77.8	61.45	6100	Moon Saddle	
102	82.75	6000	78.1	61.55	6140	Leaning Tree Camp	
103	83.05	6320	78.4	61.80	6520	peak 6575	
104	83.30	6270	78.6	62.00	6420	dip	
105	83.55	6320	78.9	62.20	6530	peak 6530	
106	84.05	6260	79.4	62.55	6460	dip	
107	84.70	6550	80.0	63.15	6750	inflect down	
108	85.70	6710	81.0	63.70	7005	inflect level	
109	86.05	6710	81.4	64.00	6990	Indian P.O. Peak 7033	
110	86.50	6520	81.8	64.50	6810	dip	
111	87.00	6680	82.3	64.80	6960	peak 7004	
112	87.20	6500	82.5	65.05	6780	dip	
113	87.65	6620	83.0	65.55	6890	peak	
114	88.05	6490	83.4	65.70	6782	dip 6782	
115	88.40	6630	83.7	66.10	6932	peak 6932	
116	88.60	6350	83.9	66.50	6600	inflect up	
117	89.35	6240	84.7	66.95	6400	inflect down	
118	89.90	5940	85.2	67.40	6090	inflect up	
119	90.40	5920	85.7	67.80	6090	dip	
120	90.65	6050	86.0	68.20	6250	peak	
121	91.10	6000	86.4	68.45	6170	dip	
122	91.90	6090	87.2	68.85	6306	Spring Mtn 6306	
123	92.15	5960	87.5	69.20	6100	inflect up	
124	92.80	5740	88.1	69.60	5860	saddle	
125	93.00	5890	88.3	69.80	6034	inflect level 6034	
126	93.60	5890	88.9	70.25	5980	inflect up	
127	94.05	6060	89.4	70.60	6252	peak 6252	
128	95.55	5272	90.9	72.30	5342	* Cayuse Junction 5342	
129	96.50	5600	91.8	73.20	6050	inflect up	
130	97.30	6720	92.6	74.00	6810	inflect down	
131	98.05	6845	93.4	74.25	6890	The Chief (Mt. Marcy)	
132	98.65	6520	94.0	74.85	6430	* saddle	

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133	98.90	6680	94.2	75.05	6650	inflect down	
134	99.40	6830	94.7	75.30	6800	peak 6879	
135	99.85	6720	95.2	75.60	6660	Saddle	
136	100.35	6870	95.7	75.95	6880	peak 6934	
137	100.95	6830	96.3	76.45	6770	slight dip	
138	101.75	6880	97.1	77.20	6835	slight peak 6882	
139	102.25	6820	97.6	77.60	6740	Saddle	
140	102.60	6870	97.9	77.90	6800	peak	
141	103.50	6710	98.8	78.60	6620	* Saddle	
142	103.75	6830	99.1	78.92	6820	* sharp peak 6888	
143	104.15	6580	99.5	79.52	6350	* inflect up (at saddle)	
144	105.00	6380	100.3	80.27	6140	* inflect level	
145	105.45	6380	100.8	80.72	6140	* inflect down	
146	105.85	6220	101.2	81.12	5647	* Papoose Saddle	
147	106.20	6340	101.5	81.62	6130	inflect level 6130	
148	106.50	6340	101.8	81.87	6125	inflect down	
149	106.70	6150	102.0	82.12	5872	Saddle 5872, Powell Jct. Road	
150	107.10	6230	102.4	82.62	5970	inflect level	
151	107.50	6220	102.8	83.17	5930	inflect down	
152	108.10	5720	103.4	83.82	5466	* Saddle 5466	
153	108.45	5880	103.8	84.12	5590	peak	
154	108.60	5830	103.9	84.17	5500	dip	
155	108.95	6050	104.3	84.52	5790	inflect down	
156	109.25	6150	104.6	84.92	5860	inflect up	
157	109.70	6552	105.0	85.17	6280	* Rocky Point 6280	
158	109.95	6210	105.3	85.47	5940	inflect up	
159	110.15	6120	105.5	85.62	5840	inflect level	
160	111.10	6100	106.4	86.42	5785	curve down 5785	
161	114.00	4229	109.3	88.42	3970	* Crooked Fork Crossing	
162	115.00	5150	110.3	89.17	4830	inflect up	
163	115.40	5819	110.7	89.57	5370	inflect down	
164	116.05	5950	111.4	90.22	5500	inflect up	
165	116.30	6090	111.6	90.47	5645	inflect level	
166	116.70	6090	112.0	90.72	5640	inflect down 5661	
167	119.00	5219	113.5	92.12	5140	Pack Creek	
168	119.60	5230	114.1	92.72	5185	L&C Glade Creek Camp	
169	120.40	5292	114.9	93.62	5199	Pack Creek (N5292)	
170	121.00	5310	115.5	94.22	5254	* Lolo Pass (circa 1912)	
171	121.20	5260	115.7	94.47	5190	dip (West Fork Lolo Cr.)	
172	121.50	5440	116.0	95.17	5410	inflect down	
173	122.10	5600	116.6	95.57	5570	Wagon Mountain	
174	122.80	5370	117.3	96.47	5340	inflect down	
175	123.20	5000	117.7	97.17	5160	inflect down	
176	123.60	4290	118.1	98.22	4241	West Fork Lolo Creek	
177	124.25	4530	118.8	98.82	4600	peak	
178	124.70	4290	119.2	99.72	4235	inflect up	
179	125.50	4160	120.0	100.07	4160	inflect level	
180	126.00	4160	120.5	100.47	4150	* Lolo Hot Springs	
181	126.20	4310	120.7	100.62	4300	inflect down	
182	126.65	4340	121.2	100.82	4330	peak	
183	127.05	4150	121.6	100.97	4140	Granite Creek	

Final Table of Corrected Data for the Nicholson Elevation Profile, Lolo Trail, 1866

184	127.95	4230	122.5	101.32	4230	L&C Camp 09/12/05	
185	128.70	4280	123.2	101.77	4270	peak	
186	130.00	4100	124.5	103.27	4045	* 2 Fords of Lolo Creek	
187	130.30	4100	124.8	103.27	4040	inflect up steeply 4034	
188	130.95	4910	125.5	103.97	4900	inflect down	
189	131.80	5150	126.3	104.62	5160	inflect level	
190	132.35	5160	126.9	105.17	5180	inflect up	
191	132.70	5240	127.2	105.62	5240	peak	
192	133.25	4810	127.8	106.02	4800	dip	
193	133.70	4850	128.2	106.42	4840	peak	
194	134.85	4500	129.4	107.57	4500	inflect down	
195	135.90	4016	130.4	108.57	3851	* Howard Cr. 3851 (Mullans Camp)	
196	136.50	4110	131.0	109.02	3945	peak	
197	137.35	4040	131.9	109.67	3875	dip (creek from North)	
198	137.70	4100	132.2	109.82	3935	peak	
199	138.35	4000	132.9	110.12	3835	Hungry Creek (inflect up)	
200	139.20	3960	133.7	110.87	3788	* Grave Creek	
201	139.60	4220	134.1	111.17	4050	peak	
202	140.05	4110	134.6	111.37	3945	dip	
203	140.25	4220	134.8	111.62	4055	peak	
204	140.50	4180	135.0	111.77	4015	dip	
205	140.70	4270	135.2	111.87	4105	inflect level	
206	141.05	4270	135.6	112.17	4105	inflect down	
207	141.65	4110	136.2	112.27	3945	Clark Creek	
208	142.20	4400	136.7	112.72	4250	peak	
209	142.85	4260	137.4	113.17	4095	Potato Gulch	
210	143.05	4390	137.6	113.47	4225	peak	
211	143.55	4230	138.1	113.97	4065	Sheldon Creek	
212	144.20	4310	138.7	114.47	4175	peak	
213	144.50	4270	139.0	114.87	4105	Smith Creek	
214	145.20	4340	139.7	115.07	4175	peak	
215	145.60	4030	140.1	115.52	3760	* Bear Creek	
216	146.00	4280	140.5	115.87	4100	peak	
217	146.70	4110	141.2	116.12	3840	Camp Creek	
218	147.45	4210	142.0	116.32	3910	inflect up	
219	147.60	4280	142.1	116.42	3980	peak	
220	148.10	4190	142.6	116.57	3920	dip	
221	148.30	4260	142.8	116.72	4020	peak	
222	150.00	3860	144.5	117.82	3580	* Woodman Creek 3542	
223	152.00	3790	146.5	119.82	3460	L&C Camp? 11/11/05	
224	154.30	3690	148.8	122.22	3390	inflect down	
225	155.00	3600	149.5	122.97	3356	inflect up 3356	
226	158.00	3590	152.5	125.97	3230	Elev. Ref.	
227	159.00	3570	153.5	126.97	3200	L&C Camp? 6/30/06	
228	160.15	3490	154.7	128.67	3155	Bitter Root River	

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Maps prepared by Steve F. Russell

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PREFACE

In 1865, the U. S. Congress appropriated \$50,000 for the construction of a wagon road from Lewiston, Idaho Territory to Virginia City in Montana Territory. In the wagon road microfilm documents in the National Archives at Washington, D.C., this road was referred to as the Virginia City and Lewiston Wagon Road (VCLWR). During this period of U. S. history, westward expansion was being implemented at a rapid pace. Many wagon road projects were being funded to create access to the new lands in the west. The VCLWR was actually one of the more minor roads. Wellington Bird of Mount Pleasant, Iowa was selected to be the wagon road superintendent and disbursing agent.

The VCLWR was never actually constructed as a wagon road. It was developed as a pack trail along the same route as the Northern Nez Perces Trail between Weippe, Idaho and Lolo Pass on the Montana-Idaho border. It was first called the Lou-Lou Fork Trail and then called the Lolo Trail. The pack trail constructed during this project is now referred to as the Bird-Truax Trail.

The survey and construction of the Bird-Truax Trail was done in the summer of 1866. George B. Nicholson, the Civil Engineer for the Bird-Truax Trail survey party made a trip over the Northern Nez Perces Trail (NNT) in 1866 with a Nez Perce guide, Tah-Tu-Tash. They started at Weippe Prairie in Idaho and went eastward to the Bitter Root Valley in Montana. The Nicholson survey represents the best knowledge we have of the NNT tread location for the century between the passage of Lewis and Clark in 1806-1806 and the trail surveys of the early 1900s by the U. S. Forest Service. In 1898 Nicholson prepared maps, based on his 1866 survey notes, that were probably used by Reuben Gold Thwaites for his 1904-1905 edition of the Original Journals of the Lewis and Clark Expedition (Thwaites, 1905).

This report presents the results of a detailed spreadsheet analysis of all data contained in Nicholson's maps. The goal of this analysis has been to accurately locate the tread of the NNT and mark it on photocopies of topographic maps. Other resources used in this analysis are the Journals of the Lewis & Clark Expedition (Moulton, 1988) and the reports on the Virginia City and Lewiston Wagon Road (Russell, 1991). Copies of the Nicholson maps were obtained from the archives of the Clearwater National Forest.

This work has benefitted from the many years I have spent hiking on the Lolo Trail System and recording the locations of the many old trail treads still extant. My extensive research records on the Virginia City and Lewiston Wagon Road (Bird-Truax Trail (BTT)) were also very beneficial because it was important to distinguish between the NNT and BTT treads.

The database developed in this research report has been extensively used to document the locations of the Lewis and Clark route and their camping places. It has also been used to determine the Lolo Trail place name locations given by other explorers such as John Work, John Mullan, and A. K. Himmelwright.

Steve F. Russell
Ames, Iowa
May 24, 1996

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Table 2-1. *Nicholson's Raw Data.* This table represents the original data from Nicholson's profile map. It has not been corrected for elevation or distance errors. Dir: e:\user \steve \trails \lolotral \research \birdtrue \nicholsn \profile2.wk1 (Lotus)

Table 3-1. *Initial Topo Data.* This table represents the first attempt at determining the topographic location of the Northern Nez Perces Trail from Nicholson's elevation profile map. Each distance and elevation point was obtained from 7.5 minute USGS topographic maps. Each point has been carefully aligned with the corresponding point on the original Nicholson profile map. (The ** denotes the distance reference point.) Dir: e:\user \steve \trails \lolotral \research \birdtrue \nicholsn \profile2.wk1 (Lotus)

GLOSSARY, SYMBOLS AND ABBREVIATIONS

Topo
Topographic Radius
Spreadsheet

1. SUMMARY

The results obtained in this research study are summarized in this section. The unscaled Nicholson distances are given to aid in determining distances from other journal records.

2. NICHOLSON PROFILE MAP DATA

To begin, the distance and elevation data on the Nicholson "Lolo Trail" profile map was carefully measured and painstakingly transcribed into **Table 2-1**. Differential distances and elevation changes were computed using a spreadsheet. Because the profile map definitely contains errors, it will eventually be necessary to crosscheck it with the data from the wagon road reports and with the two other maps produced by Nicholson. This profile data is also the best extant documentation for the location of the NNT and for the route followed by Lewis & Clark from Lolo, Montana to Willow Ridge in Idaho. A graphical presentation of the tabular data for **Table 2-1** is provided in **Figures 2-1** through **2-9**. Detailed profile maps were produced at the same abscissa (x) and ordinate (y) scales to permit complete reconstruction of the original Nicholson profile. This data will now be explained.

In **Table 2-1**, Column 1 shows the reference number assigned to each distance/elevation/place-name reference point. There are a total of 228 reference points on Nicholson's profile map. Column 2 show the reference names, assigned by the author using the Bird-Truax Journals, for each point. A simple description of the graphical shape of the feature is given when no place name is available. Column 3 is the distance, in miles, from Oyipe Prairie {mistakenly identified in the mays at the location of Heywood Meadows} to the reference point. For example, Meadow Mountain {Bald Mountain}, reference point 66, is 62.6 miles from Oyipe Prairie. Column 4 shows the distance, in miles, between adjacent reference points. Column 5 shows the recorded barometric elevation in feet. Column 6 is the elevation change between adjacent reference points. The changes in distance and elevation are included because they frequently help provide better location accurately than do the reference distance or elevation values alone.

We know; 1) from Nicholson's comments, 2) from the distance and elevation measurement technology used, and 3) from the nature of recording filed data, that Nicholson's profile map contains errors. These errors will be discussed in detail later in the section on the approach to the analysis of data. The data in **Table 2-1** has not been corrected for known errors. It represents exactly what Nicholson recorded on his profile map. Reference point #89, Snow Bridge Gulch, was entered twice because Nicholson's data has such a big discontinuity there. This was necessary to facilitate later data analysis. The figures will now be described.

Figure 2-1. Nicholson's Profile Map. The entire profile map is plotted on one page to give the reader an overall concept of the distance and elevation variability for the Northern Nez Perces Trail. In Chapter 7 of this report, major locations on the route are referenced with an arrow and a modern place name.

Figure 2-2. Muscle Shell Prairie {Musselshell Meadows}. This is the profile between Heywood Meadows and Lolo Forks. On the left, it shows the crossing of Brown's Creek Ridge. On the right is the route up the ridge north of Musselshell Meadows and eastward across Siberia Creek and to Lolo Forks.

Figure 2-3. The Neck {Camp Martin}. This is a profile between Lolo Forks and Rocky Ridge. Camp

Martin, Snowy Summit, and Beaver Dam Saddle are on the right. The ten-mile interval on the left has no features and is not accurate (as noted by Nicholson).

Figure 2-4. Mt. Romeo {Willow Ridge}. This is the profile between Weitus Meadows and No-See-Um Meadows. The peaks are Bowl Butte and Willow Ridge. The sharp dips are Deep Saddle and Sherman Saddle. No-See-Um Meadows is the small dip on the right. This is one of the most severe profiles on the entire route. It illustrates how difficult travel was along the Northern Nez Perces Trail.

Figure 2-5. Snow Bridge {Gravey Creek}. The profile from Bald Mountain to Howard Camp shows good travelling except for the major dip where the trail left the ridge and went into Gravey Creek. This dip into Gravey Creek is one of the major discontinuities in the records of this trail.

Figure 2-6. Lake Templin {Cayuse Junction}. This is the profile between Moon Saddle and east of Cayuse Junction. Indian Post Office and Spring Mountain are on the left.

Figure 2-7. Independence Camp {Papoose Saddle}. This is the profile between Papoose Saddle and Packer Meadows. The very steep dip in and out of Crooked Fork was one of the most difficult parts of the trail. Rocky Point is the sharp peak and the trail crossing Crooked Fork is shown.

Figure 2-8. Hot Spring {Lolo Hot Springs}. The profile between Lolo Pass and Grave Creek shows the steep decent to Lolo Hot Springs and the major diversion on a ridge to the north to avoid the impassable bottom of Lolo Creek west of Howard Creek. The old trail crossed Lolo Creek twice before ascending the steep ridge.

Figure 2-9. Large Creek {Bear Creek}. The route from Grave Creek to Lolo, Montana presented no large changes in elevation. This route followed the meadows of lower Lolo Creek east of Woodman Creek and stayed in the foothills west of Woodman Cr.

Table 2-1. Nicholson's Original Raw Data. This table represents the original data from Nicholson's profile map. It has not been corrected for elevation or distance errors.					
Dir: e:\user\steve\trails\lolotral\research\birdtrue\nicholsn					
File: profile2.wk1 ("page 5") (spreadsheet)					
0	---				
1	Oyipe Prairie	0.00		3228	0
2	inflect up	0.70	0.70	3232	4
3	inflect up	1.05	0.35	3240	8
4	inf down	1.50	0.45	3350	110
5	peak	1.80	0.30	3370	20
6	dip	2.70	0.90	3240	-130

7	peak	3.05	0.35	3300	60
8	dip	3.40	0.35	3260	-40
9	peak	3.75	0.35	3280	20
10	dip	4.00	0.25	3230	-50
11	peak	4.60	0.60	3310	80
12	shallow dip	7.25	2.65	3245	-65
13	Muscle Shell Prairie	10.00	2.75	3367	122
14	E. Branch Muscle Shell	10.60	0.60	3367	0
15	infl down	11.00	0.40	3600	233
16	shallow peak	11.20	0.20	3610	10
17	shallow dip	11.30	0.10	3570	-40
18	peak	12.15	0.85	3750	180
19	dip	12.30	0.15	3680	-70
20	inflect down	12.80	0.50	3750	70
21	peak	13.40	0.60	3770	20
22	small dip	13.45	0.05	3750	-20
23	peak	14.50	1.05	3826	76
24	"dip (creek, runs south)"	15.15	0.65	3620	-206
25	inflect down	15.60	0.45	3820	200
26	peak	16.15	0.55	3920	100
27	inflect up	16.40	0.25	3800	-120
28	dip (creek)	17.00	0.60	3680	-120
29	strange peak!	17.25	0.25	3730	50
30	Lo-Lo (Collins) Cr.	18.00	0.75	3600	-130
31	inflect up	19.10	1.10	3900	300
32	inflect down	19.95	0.85	4270	370
33	Ridge Camp	30.00	10.05	4659	389
34	inflect up	30.95	0.95	4860	201
35	inflect down	31.10	0.15	4940	80

36	peak	32.45	1.35	5210	270
37	dip (The Neck)	32.75	0.30	5140	-70
38	Mt. Truax peak	33.85	1.10	5944	804
39	inflect down	35.45	1.60	5890	-54
40	dip	36.85	1.40	5360	-530
41	"inflect, Squirrel Mtn"	37.90	1.05	6015	655
42	"peak, Squirrel Mtn"	40.00	2.10	6220	205
43	dip (runs south)	40.30	0.30	5900	-320
44	peak	40.95	0.65	6200	300
45	"Huston Creek, runs north"	43.95	3.00	5490	-710
46	peak	45.80	1.85	5880	390
47	dip	47.00	1.20	5750	-130
48	Mt. Juliet	48.50	1.50	6532	782
49	deep dip	50.30	1.80	5420	-1112
50	Mt. Romeo	51.65	1.35	6616	1196
51	inflect down	52.50	0.85	6300	-316
52	deep dip	54.20	1.70	5110	-1190
53	inflect down	55.35	1.15	5960	850
54	inflect down	56.20	0.85	6250	290
55	peak	56.80	0.60	6390	140
56	dip	56.90	0.10	6330	-60
57	peak	57.65	0.75	6530	200
58	inflect up	58.10	0.45	6230	-300
59	Prairie Gulch	58.55	0.45	6120	-110
60	sharp peak	59.00	0.45	6570	450
61	inflect up	59.25	0.25	6400	-170
62	dip	59.65	0.40	6290	-110
63	inflect up	60.20	0.55	6370	80
64	sharp peak	60.50	0.30	6510	140

65	dip	60.95	0.45	6260	-250
66	"Meadow Mt., Bird's Camp"	62.60	1.65	6528	268
67	dip	63.80	1.20	6140	-388
68	inflect down	64.60	0.80	6400	260
69	inflect down	65.25	0.65	6560	160
70	small peak	66.50	1.25	6590	30
71	small dip	66.80	0.30	6530	-60
72	inflect level	67.40	0.60	6740	210
73	inflect up	67.80	0.40	6740	0
74	inflect level	67.95	0.15	6780	40
75	inflect down	68.30	0.35	6780	0
76	dip	68.45	0.15	6580	-200
77	Castle Rock	69.40	0.95	6770	190
78	dip	69.70	0.30	6580	-190
79	peak	70.20	0.50	6760	180
80	inflect down	70.50	0.30	6600	-160
81	dip	71.10	0.60	6500	-100
82	peak	71.40	0.30	6590	90
83	Sinque Hole	71.60	0.20	6300	-290
84	peak	72.40	0.80	6520	220
85	"L&C Camp, Dip"	72.90	0.50	6200	-320
86	peak	73.20	0.30	6370	170
87	inflect down	73.70	0.50	6180	-190
88	inflect up	73.90	0.20	5900	-280
89	Snow Bridge (runs north)	75.60	1.70	5160	-740
89	Snow Bridge (runs north)	75.60	0.00	5160	0
90	inflect down	77.15	1.55	6100	940
91	major peak	78.10	0.95	6270	170
92	major dip	78.50	0.40	5920	-350

93	peak	79.10	0.60	6160	240
94	dip	79.50	0.40	6080	-80
95	peak	80.05	0.55	6440	360
96	dip	80.30	0.25	6330	-110
97	peak	80.75	0.45	6440	110
98	dip	81.20	0.45	6280	-160
99	inflect down	81.55	0.35	6480	200
100	peak	81.75	0.20	6530	50
101	major dip	82.45	0.70	5950	-580
102	Leaning Tree	82.75	0.30	6000	50
103	peak	83.05	0.30	6320	320
104	dip	83.30	0.25	6270	-50
105	peak	83.55	0.25	6320	50
106	dip	84.05	0.50	6260	-60
107	inflect down	84.70	0.65	6550	290
108	inflect level	85.70	1.00	6710	160
109	inflect down	86.05	0.35	6710	0
110	dip	86.50	0.45	6520	-190
111	peak	87.00	0.50	6680	160
112	dip	87.20	0.20	6500	-180
113	peak	87.65	0.45	6620	120
114	dip	88.05	0.40	6490	-130
115	peak	88.40	0.35	6630	140
116	inflect up	88.60	0.20	6350	-280
117	inflect down	89.35	0.75	6240	-110
118	inflect up	89.90	0.55	5940	-300
119	dip	90.40	0.50	5920	-20
120	peak	90.65	0.25	6050	130
121	dip	91.10	0.45	6000	-50

122	"L&C Camp, peak"	91.90	0.80	6090	90
123	inflect up	92.15	0.25	5960	-130
124	dip(local min)	92.80	0.65	5740	-220
125	inflect level	93.00	0.20	5890	150
126	inflect up	93.60	0.60	5890	0
127	peak	94.05	0.45	6060	170
128	Lake Templin	95.55	1.50	5272	-788
129	inflect up	96.50	0.95	5600	328
130	inflect down	97.30	0.80	6720	1120
131	Mt. Marcy	98.05	0.75	6845	125
132	dip	98.65	0.60	6520	-325
133	inflect down	98.90	0.25	6680	160
134	peak	99.40	0.50	6830	150
135	dip	99.85	0.45	6720	-110
136	peak	100.35	0.50	6870	150
137	dip	100.95	0.60	6830	-40
138	peak	101.75	0.80	6880	50
139	dip	102.25	0.50	6820	-60
140	peak	102.60	0.35	6870	50
141	dip	103.50	0.90	6710	-160
142	sharp peak	103.75	0.25	6830	120
143	inflect up	104.15	0.40	6580	-250
144	inflect level	105.00	0.85	6380	-200
145	inflect down	105.45	0.45	6380	0
146	Independence Camp	105.85	0.40	6220	-160
147	inflect level	106.20	0.35	6340	120
148	inflect down	106.50	0.30	6340	0
149	dip	106.70	0.20	6150	-190
150	inflect level	107.10	0.40	6230	80

151	inflect down	107.50	0.40	6220	-10
152	major dip	108.10	0.60	5720	-500
153	peak	108.45	0.35	5880	160
154	dip	108.60	0.15	5830	-50
155	inflect down	108.95	0.35	6050	220
156	inflect up	109.25	0.30	6150	100
157	"Mt. Simpson,Pnt.of Rocks"	109.70	0.45	6552	402
158	inflect up	109.95	0.25	6210	-342
159	inflect level	110.15	0.20	6120	-90
160	curve down	111.10	0.95	6100	-20
161	Kooskooskee R.	114.00	2.90	4229	-1871
162	inflect up	115.00	1.00	5150	921
163	inflect down	115.40	0.40	5819	669
164	inflect up	116.05	0.65	5950	131
165	inflect level	116.30	0.25	6090	140
166	inflect down	116.70	0.40	6090	0
167	Glade Creek	119.00	2.30	5219	-871
168	L&C Camp 9/13/05	119.60	0.60	5230	11
169	Glade Creek Crossing	120.40	0.80	5292	62
170	"Divide, Bitter Rts"	121.00	0.60	5310	18
171	dip	121.20	0.20	5260	-50
172	inflect down	121.50	0.30	5440	180
173	peak	122.10	0.60	5600	160
174	inflect down	122.80	0.70	5370	-230
175	inflect down	123.20	0.40	5000	-370
176	Ford of LouLou Cr.	123.60	0.40	4290	-710
177	peak	124.25	0.65	4530	240
178	inflect up	124.70	0.45	4290	-240
179	inflect level	125.50	0.80	4160	-130

180	Hot Spring	126.00	0.50	4160	0
181	inflect down	126.20	0.20	4310	150
182	peak	126.65	0.45	4340	30
183	dip	127.05	0.40	4150	-190
184	L&C Camp 9/12/05	127.95	0.90	4230	80
185	peak	128.70	0.75	4280	50
186	2 Fords LouLou Cr.	130.00	1.30	4100	-180
187	inflect up steep	130.30	0.30	4100	0
188	inflect down	130.95	0.65	4910	810
189	inflect level	131.80	0.85	5150	240
190	inflect up	132.35	0.55	5160	10
191	peak	132.70	0.35	5240	80
192	dip	133.25	0.55	4810	-430
193	peak	133.70	0.45	4850	40
194	inflect down	134.85	1.15	4500	-350
195	Mullans Camp	135.90	1.05	4016	-484
196	peak	136.50	0.60	4110	94
197	dip (creek from North)	137.35	0.85	4040	-70
198	peak	137.70	0.35	4100	60
199	inflect up	138.35	0.65	4000	-100
200	dip	139.20	0.85	3960	-40
201	peak	139.60	0.40	4220	260
202	dip	140.05	0.45	4110	-110
203	peak	140.25	0.20	4220	110
204	dip	140.50	0.25	4180	-40
205	inflect level	140.70	0.20	4270	90
206	inflect down	141.05	0.35	4270	0
207	dip (creek from North)	141.65	0.60	4110	-160
208	peak	142.20	0.55	4400	290

209	dip	142.85	0.65	4260	-140
210	peak	143.05	0.20	4390	130
211	dip (creek from North)	143.55	0.50	4230	-160
212	peak	144.20	0.65	4310	80
213	dip	144.50	0.30	4270	-40
214	peak	145.20	0.70	4340	70
215	Large Creek from North	145.60	0.40	4030	-310
216	peak	146.00	0.40	4280	250
217	dip (creek from North)	146.70	0.70	4110	-170
218	inflect up	147.45	0.75	4210	100
219	peak	147.60	0.15	4280	70
220	dip	148.10	0.50	4190	-90
221	peak	148.30	0.20	4260	70
222	inflect up	150.00	1.70	3860	-400
223	"L&C Camp, 9/11/05"	152.00	2.00	3790	-70
224	inflect down	154.30	2.30	3690	-100
225	inflect up	155.00	0.70	3600	-90
226	Elev. Ref.	158.00	3.00	3590	-10
227	L&C Camp 6/30/06	159.00	1.00	3570	-20
228	Bitter Root River	160.15	1.15	3490	-80

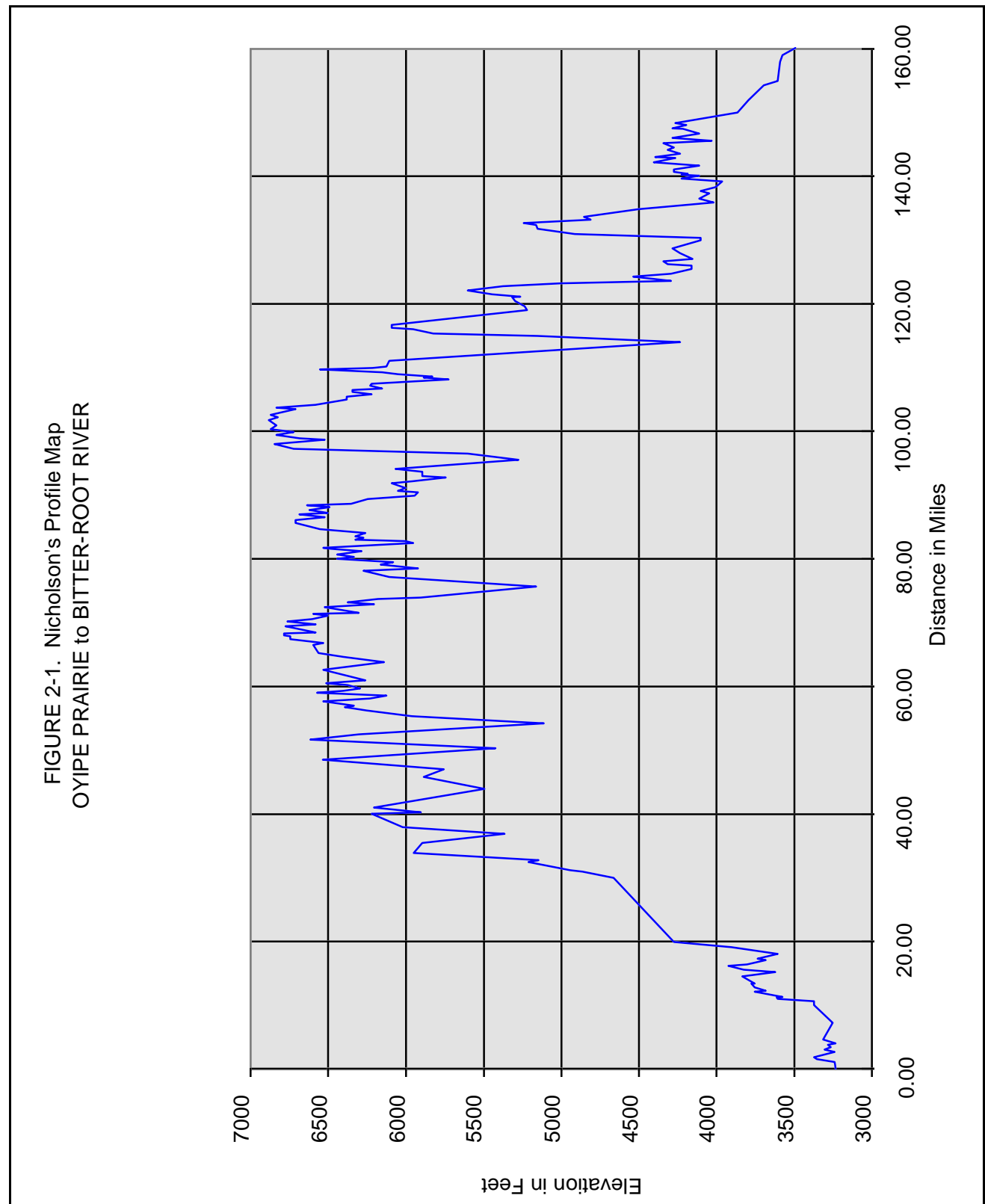


Figure 2-1 Nicholsons' original profile map prepared in 1898 and based on the 1866 survey.

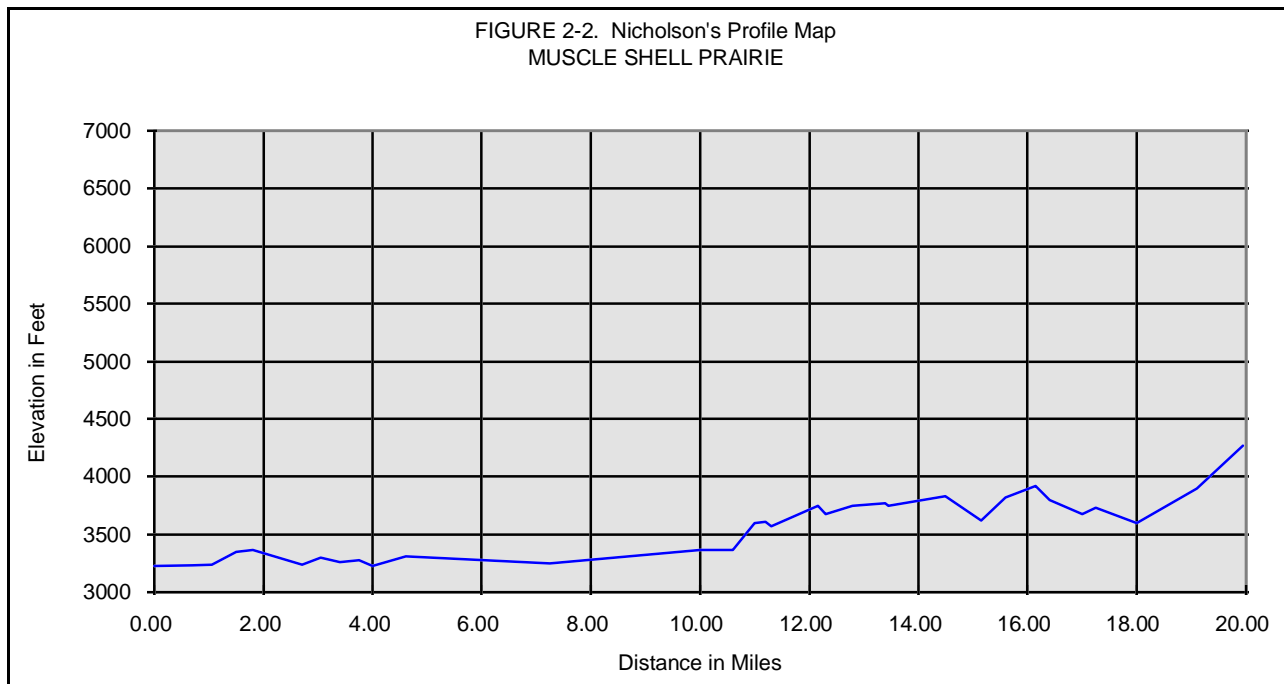


Figure 2-2 Nicholsons' original profile map prepared in 1898 - Muscle Shell Prairie.

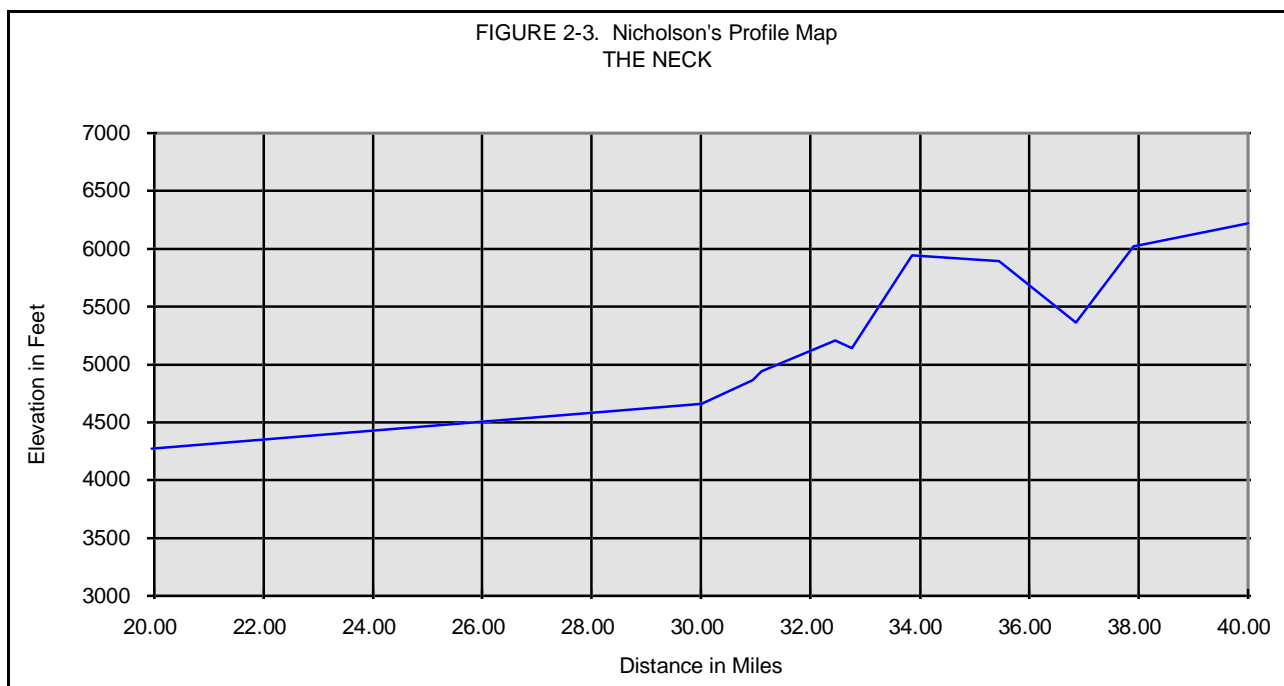


Figure 2-3 Nicholsons' original profile map prepared in 1898 - The Neck.

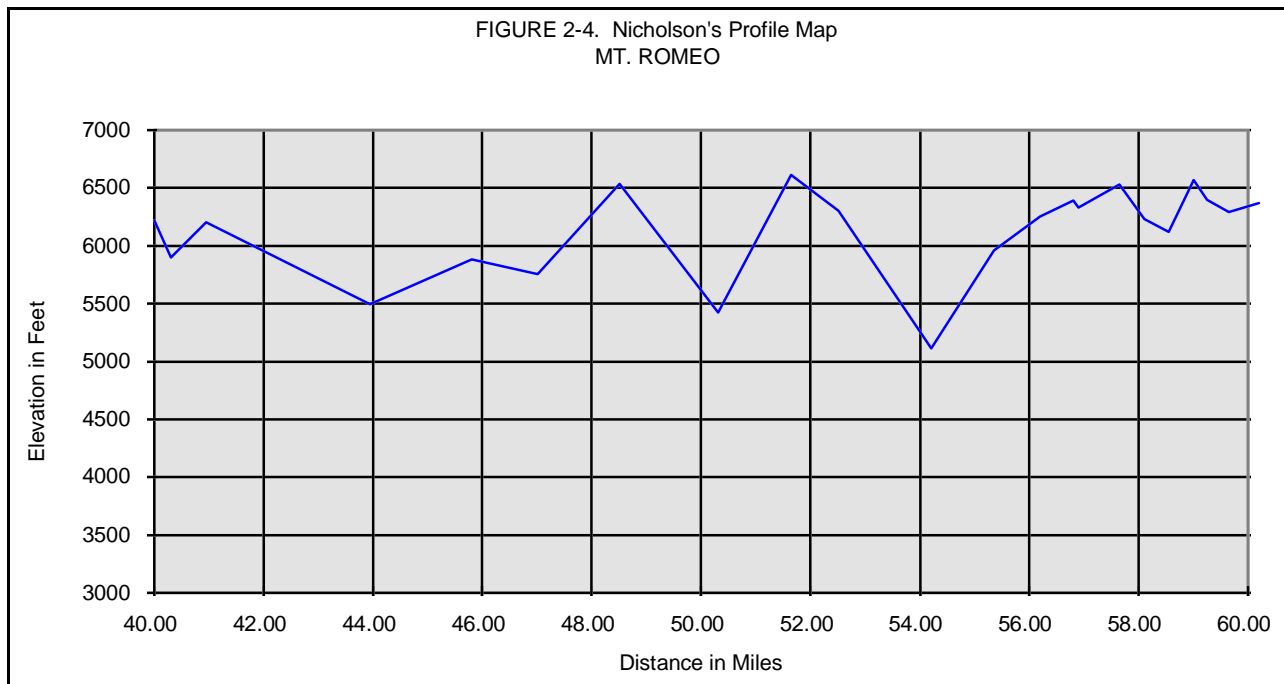


Figure 2-4 Nicholsons' original profile map prepared in 1898 - Mt. Romeo.

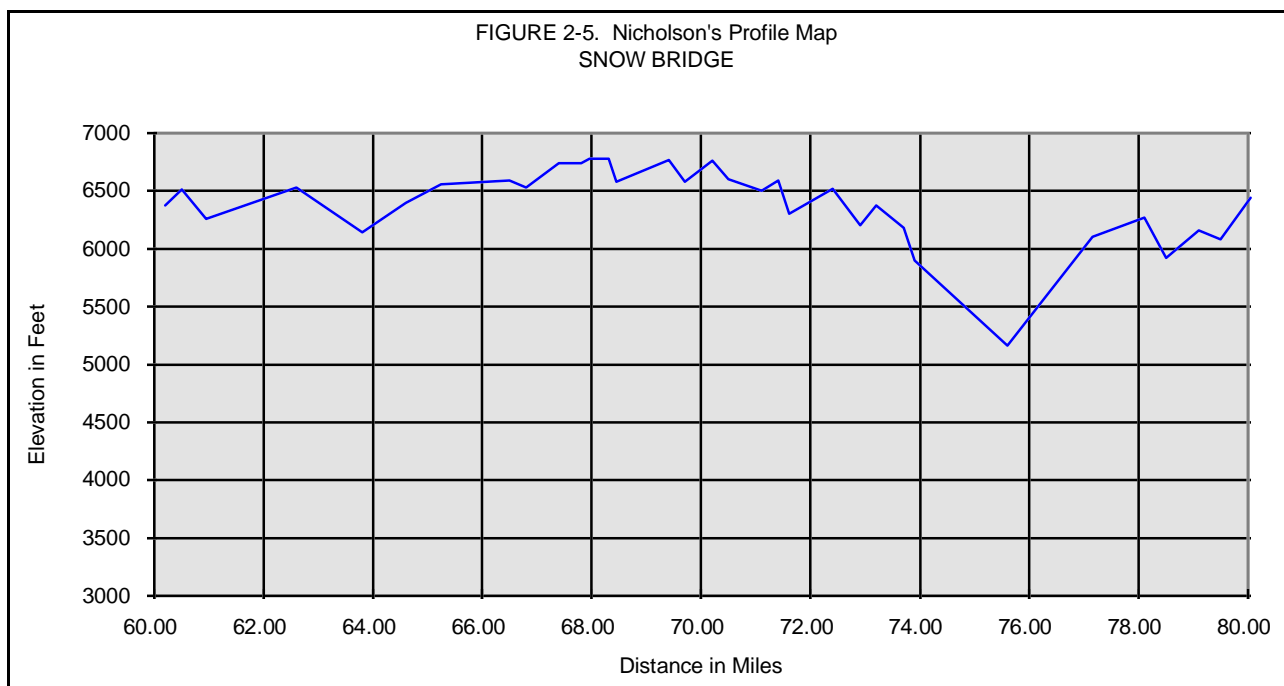


Figure 2-5 Nicholsons' original profile map prepared in 1898 - Snow Bridge Gulch

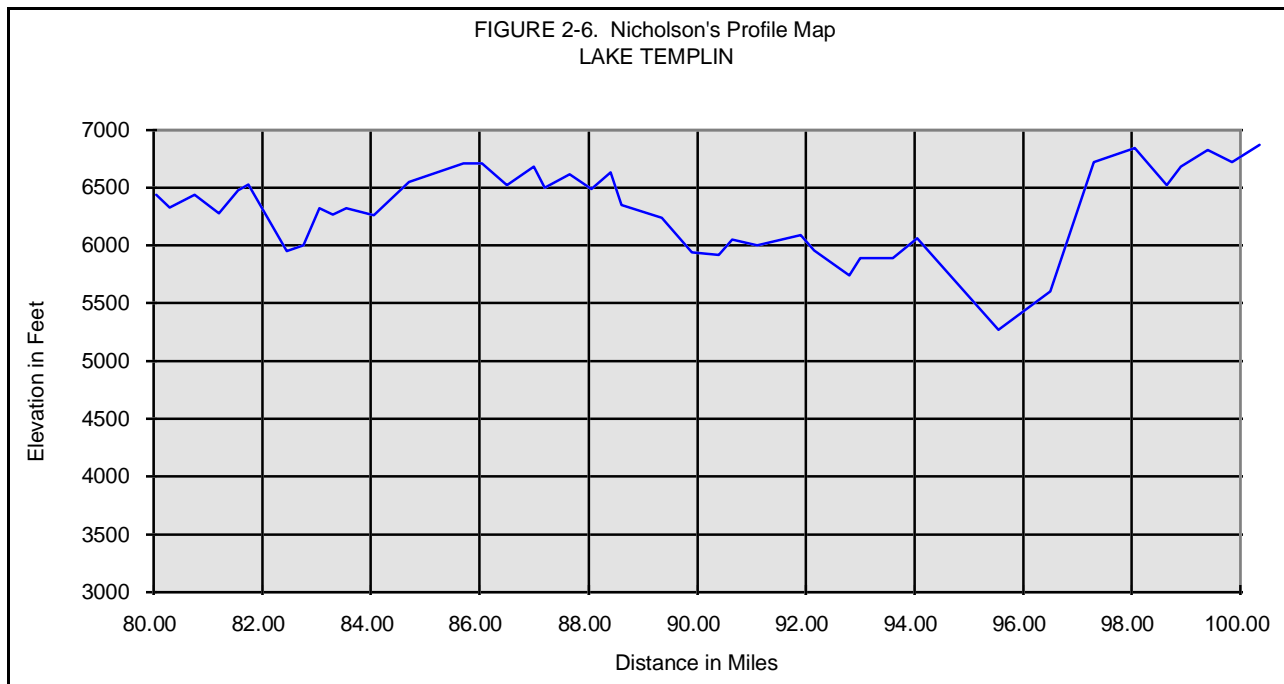


Figure 2-6 Nicholsons' original profile map prepared in 1898 - Lake Templin.

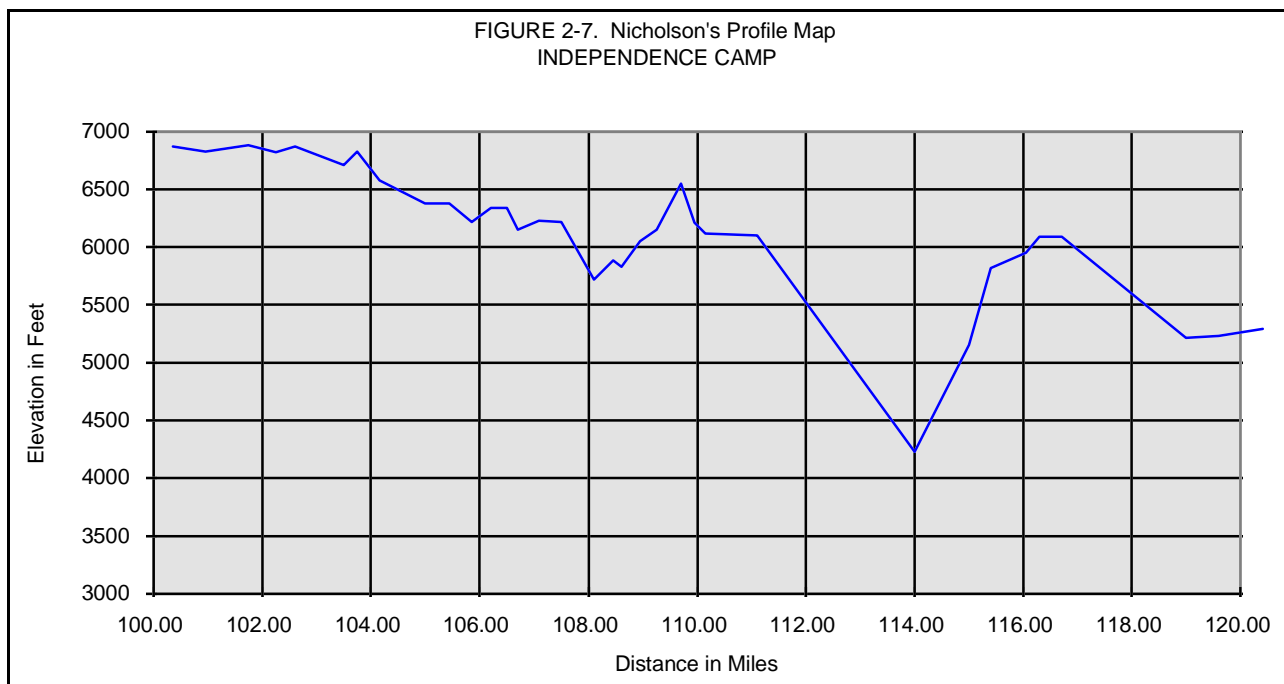


Figure 2-7 Nicholsons' original profile map prepared in 1898 - Independence Camp.

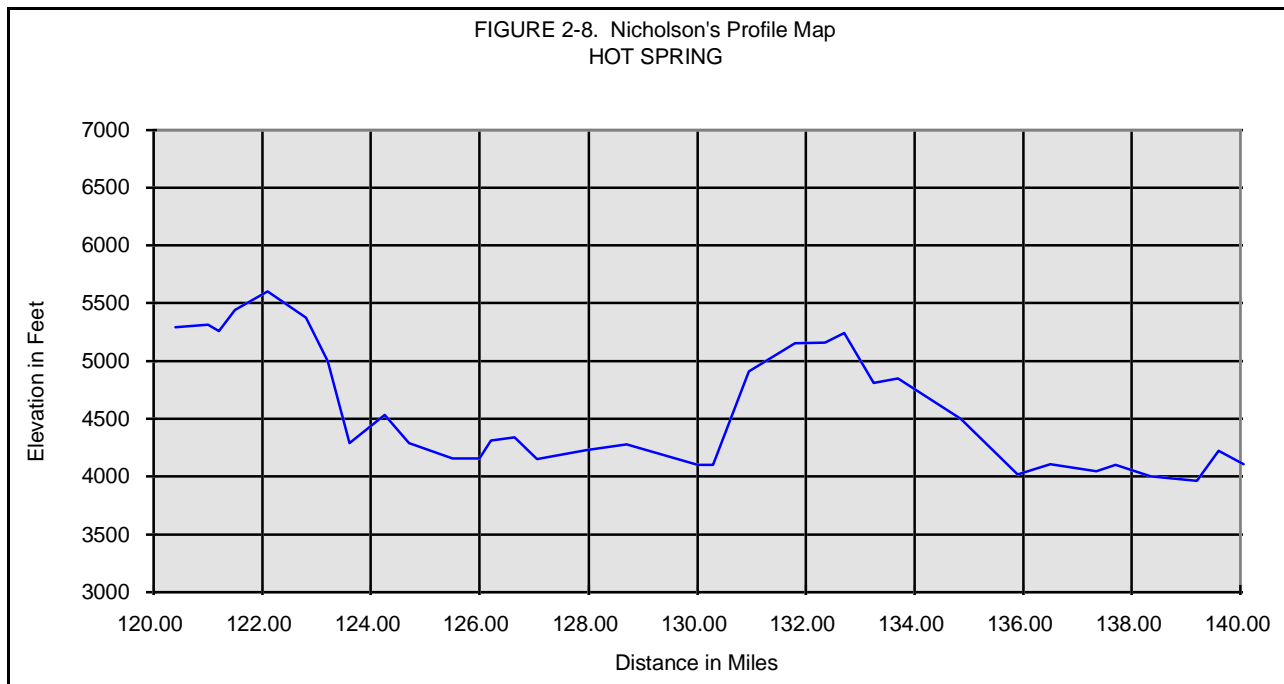


Figure 2-8 Nicholsons' original profile map prepared in 1898 - Hot Spring.

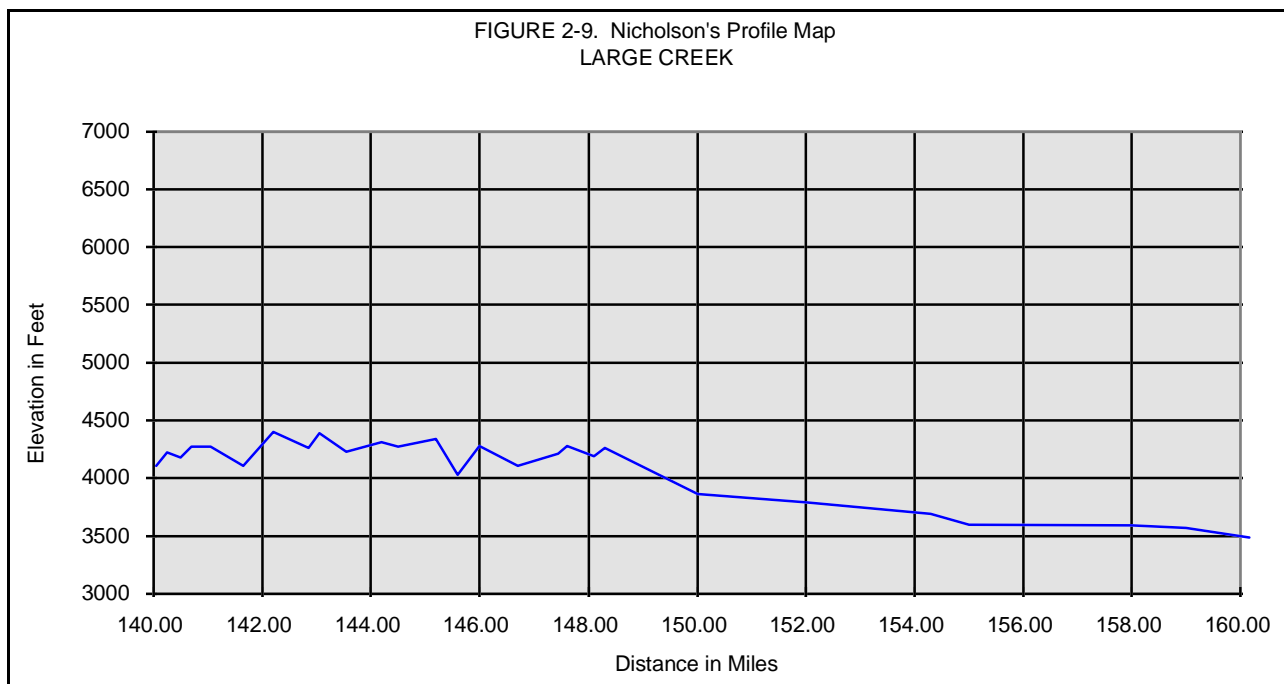


Figure 2-9 Nicholsons' original profile map prepared in 1898 - Large Creek.

3. INITIAL TOPOGRAPHIC ESTIMATES

The distance and elevation points from the Nicholson profile map were carefully located on a 7.5 minute topographic map and the corresponding data were aligned with the Nicholson reference points and entered in the spreadsheet. The experience gained in studying the Bird-Truax Trail was also used to help place the initial tread location. Where possible, the modern place name for each data point was used for the topo data table. Since the Nicholson and topo distances do not agree, a distance reference point was selected. It is Beaver Dam Saddle which is at 36.85 miles on the Nicholson profile map. This corresponds to the mileage reference [130.1] on the Virginia City and Lewiston Wagon Road.

For these initial estimates, the tread location was assumed to be directly over the peaks and through the saddles. It is possible that the detailed analysis will show that the trail "short-cut" some of the peaks. In order to make this initial topo estimate, it was first necessary to analyze some of the errors in Nicholson's data. A detailed description of this error analysis is presented in the next section.

Table 3-1 represents the first attempt at determining the topographic location of the Northern Nez Perces Trail from Nicholson's elevation profile map. Each distance and elevation point was obtained from 7.5 minute USGS topographic maps. Each point has been carefully aligned with the corresponding point on the original Nicholson profile map. Column 1 shows the reference number assigned to each distance/elevation reference point. The are chosen to agree with the survey reference points chosen by Nicholson. Column 2 shows the modern place name for each point. A simple description of the graphical shape of the feature is given when no place name is available. Reference point zero has been added to indicate the modern "traditional" starting point for the Northern Nez Perces Trail, the Weippe Prairie. Column 3 is the distance assignment, in miles, for each reference. The distance assignment does not start at zero because Beaver Dam Saddle [36.85mi] is used as the absolute reference between data sets. Column 4 shows the distance, in miles, between reference points. Column 5 shows the topographic elevation of each point, in feet. Column 6 is the elevation change between reference points. The changes in distance and elevation are included as a comparison against the same data in the Nicholson profile.

Figure 3-1. Initial Topo Profile Map. This plot shows the complete Topo elevation profile for the Northern Nez Perces Trail of 1866, from Weippe Prairie, Idaho to Lolo, Montana. The rest of the figures in this section are detailed profile maps plotted as a function of reference point number. Reference number was used to maximize the resolution and to permit direct comparison of the two data sets. The ordinate (y), elevation, has been selected to give maximum resolution and will vary with each plot. The Nicholson elevation data is also shown for comparison purposes.

Figure 3-2. Musselshell Meadows. This is the profile between Heywood Meadows and Lolo Forks. The Nicholson elevations are consistently higher than the actual elevations. This is caused by barometric pressure variations.

Figure 3-3. Lolo Forks. This is a profile from west of Lolo Forks and Rocky Ridge. The Nicholson elevations are much closer to the Topo values. The 10-mile inaccurate interval is minimized because data is given as a function of reference number rather than distance.

Figure 3-4. Willow Ridge. This is the profile between Weitus Meadows and No-See-Um Meadows. The peaks are Bowl Butte and Willow Ridge. Here again, barometric pressure variation have caused the Nicholson values to be much higher than the topographic values.

Figure 3-5. Bald Mountain. The profile from No-See-Um Meadows to Smoking Place. Nicholson elevations are high.

Figure 3-6. Saddle Camp. The profile from Indian Grave Camp to Moon Saddle contains the major discontinuity at Gravey Creek (Saddle Camp). The Topo elevation is given for a trail location just above the forks of Gravey Creek and Serpent Creek. This is the location referenced by Lewis and Clark and also by Nicholson in a footnote in the Thwaites version of the Lewis and Clark Journals. This location is in controversy because of the lack of complete and accurate documentation.

Figure 3-7. Moon Saddle. This is the profile between Moon Saddle and Spring Mountain. Now we see that the Nicholson elevations are much lower than the Topo elevations.

Figure 3-8. Cayuse Junction. The profile between Spring Mountain and Papoose Saddle contains the very deep dip at Cayuse Junction. This "deep hollow" was noted in most of the journals of Lolo Trail travelers. The Nicholson elevations are now much closer to the Topo elevations.

Figure 3-9. Papoose Saddle. This is the profile between the ridge west of Papoose saddle and Rocky Point. It contains another of the elevation discontinuities at #146, Papoose Saddle.

Figure 3-10. Lolo Pass 1912. This profile contains the crossing of Crooked Fork (#161), Glade Creek Camp (#167), Lolo Pass 1912 (#170), and Lolo Hot Springs (#180). The Nicholson elevations prior to Packer Meadows is much higher than the Topo elevations but east of Glade Creek Camp, the elevations are extremely close.

Figure 3-11. Lolo Hot Springs. This is the profile from Lolo Hot Springs (#180) to Grave Creek (#200). The large elevation "hump" is the route on the ridge to the north around the bottom of Lolo Creek and into Howard Creek (#195)

Figure 3-12. Bear Creek. The profile from Grave Creek to Camp Creek (#217) has many small ups and downs because it crosses the foothills to the north of Lolo Creek. The major dip on this route is at Bear Creek (#215).

Figure 3-13. Bitter Root River. From Woodman Creek (#222) to the Bitter Root River (#228) the grade is the gentle slope along Lolo Creek. Nicholson identified the Lewis & Clark camp of September 11, 1805 as being east of Woodman Creek about two miles. This agrees with the Lewis & Clark journals and there was probably still evidence of the "regular" Indian camping place there.

Table 3-1. Initial Topo Data. This table represents the first attempt at determining the topographic location of the Northern Nez Perces Trail from Nicholson's elevation profile map. Each distance and elevation point was obtained from 7.5 minute USGS topographic maps. Each point has been carefully aligned with the corresponding point on the original Nicholson profile map. (The ** denotes the distance reference point.)

Dir: e:\user\steve\trails\lolotral\research\birdtrue\nicholson
File: profile2.wk1, ("page 6") (spreadsheet)

0	Weippe Prairie 3007	11.40		3020	
1	Heywood Meadows 3088	14.70	3.30	3070	50
2	inflect up	15.00	0.30	3120	50
3	inflect up	15.45	0.45	3300	180
4	inf down	15.75	0.30	3410	110
5	Browns Creek Saddle 3396	16.00	0.25	3445	35
6	dip	17.20	1.20	3195	-250
7	peak	17.35	0.15	3235	40
8	dip	17.55	0.20	3205	-30
9	peak	17.70	0.15	3220	15
10	dip	17.85	0.15	3185	-35
11	peak	17.95	0.10	3195	10
12	shallow dip (Small Prairie)	20.75	2.80	3140	-55
13	Musselshell Prairie 3182	22.55	1.80	3180	40
14	Musselshell Cr. Crossing	23.15	0.60	3187	7
15	infl down	23.60	0.45	3395	208
16	shallow peak	23.85	0.25	3450	55
17	shallow dip 3424	24.00	0.15	3424	-26
18	peak 3646	24.80	0.80	3646	222
19	dip	25.00	0.20	3590	-56
20	inflect down	25.10	0.10	3640	50
21	peak	25.35	0.25	3690	50

22	small dip	25.40	0.05	3660	-30
23	peak	25.85	0.45	3725	65
24	Siberia Creek	26.35	0.50	3445	-280
25	inflect down	26.50	0.15	3680	235
26	peak	26.65	0.15	3725	45
27	inflect up	26.75	0.10	3680	-45
28	Dutchman Creek	27.05	0.30	3395	-285
29	strange peak!	27.20	0.15	3500	105
30	Lolo Forks 3389	27.65	0.45	3389	-111
31	inflect up	27.95	0.30	3760	371
32	inflect down 4251	29.05	1.10	4251	491
33	Ridge Camp	32.15	3.10	4885	634
34	inflect up	32.60	0.45	4780	-105
35	inflect down	33.00	0.40	5140	360
36	peak	33.45	0.45	5340	200
37	Camp Martin 5144	33.60	0.15	5144	-196
38	Snowy Summit	34.65	1.05	6040	896
39	inflect down	35.75	1.10	6020	-20
40	Beaver Dam Saddle 5302	36.85	1.10	5302	-718
41	"inflect, Squirrel Mtn 5914"	37.75	0.90	5914	612
42	Squirrel Mtn. 6257	39.25	1.50	6235	321
43	dip (runs south)	40.05	0.80	5840	-395
44	peak	40.35	0.30	6140	300
45	Little Weitas Creek 5412	41.70	1.35	5385	-755
46	peak	42.75	1.05	5805	420
47	Green Saddle	43.75	1.00	5420	-385
48	Bowl Butte 6365	44.85	1.10	6365	945
49	Deep Saddle 5027	46.20	1.35	5027	-1338
50	Willow Ridge 6500	47.15	0.95	6500	1473

51	inflect down 5801	48.10	0.95	5801	-699
52	Sherman Saddle	48.95	0.85	4737	-1064
53	inflect down 5725	49.80	0.85	5725	988
54	inflect down 6090	50.60	0.80	6090	365
55	peak 6230	51.10	0.50	6230	140
56	dip	51.20	0.10	6130	-100
57	Ridge NE of Sherman Peak	51.85	0.65	6260	130
58	inflect up	52.10	0.25	6020	-240
59	No-See-Um Meadows 5890	52.45	0.35	5890	-130
60	sharp peak	52.85	0.40	6320	430
61	inflect up	53.15	0.30	6030	-290
62	saddle 5894	53.65	0.50	5894	-136
63	inflect up	54.35	0.70	6070	176
64	sharp peak	54.50	0.15	6140	70
65	Saddle	54.95	0.45	5860	-280
66	Bald Mountain	56.45	1.50	6300	440
67	saddle 5782	57.30	0.85	5782	-518
68	inflect down	58.05	0.75	6066	284
69	inflect down 6066	58.20	0.15	6220	154
70	small peak 6276	58.65	0.45	6276	56
71	small dip	58.85	0.20	6180	-96
72	inflect level	59.75	0.90	6500	320
73	inflect up	60.05	0.30	6500	0
74	inflect level 6555	60.20	0.15	6555	55
75	inflect down 6554	60.60	0.40	6554	-1
76	Saddle	60.95	0.35	6340	-214
77	Castle Rock 6592	61.65	0.70	6592	252
78	saddle	62.00	0.35	6380	-212
79	Smoking Place 6574	62.35	0.35	6574	194

80	inflect	62.90	0.55	6410	-164
81	Indian Grave Camp	63.20	0.30	6280	-130
82	small peak	63.35	0.15	6370	90
83	Sinque Hole	63.80	0.45	5980	-390
84	peak 6279	64.30	0.50	6279	299
85	Saddle	64.55	0.25	5860	-419
86	peak 6099	64.80	25.00	6099	239
87	inflect down	65.50	0.35	5980	-119
88	inflect up 5634	65.40	0.25	5750	-230
89	Snow Bridge Gulch (runs N.)	67.30	1.90	4570	-1180
89	Snow Bridge Gulch (runs N.)	67.30	0.00	4570	0
90	inflect down	69.20	1.90	6260	1690
91	Moccasin Peak (at saddle)	69.80	0.60	6380	120
92	Howard Camp (saddle)	70.50	0.70	6070	-310
93	peak 6308	70.70	0.20	6308	238
94	saddle between	70.90	0.20	6230	-78
95	peak 6635	71.30	0.40	6635	405
96	saddle	71.50	0.20	6490	-145
97	peak 6658	71.65	0.15	6658	168
98	saddle 6441	72.30	0.65	6441	-217
99	inflect down	72.60	0.30	6620	179
100	peak 6773	72.80	0.20	6673	53
101	Moon Saddle	73.25	0.45	6090	-583
102	Leaning Tree Camp	73.35	0.10	6140	50
103	peak 6575	73.60	0.25	6575	435
104	dip	73.80	0.20	6420	-155
105	peak 6530	74.00	0.20	6530	110
106	dip	74.35	0.35	6460	-70
107	inflect down	74.95	0.60	6750	290

108	inflect level	75.55	0.60	7005	255
109	Indian P.O. Peak 7033	75.85	0.30	7033	28
110	dip	76.40	0.55	6810	-223
111	peak 7004	76.70	0.30	7004	194
112	dip	76.95	0.25	6780	-224
113	peak	77.45	0.50	6890	110
114	dip 6782	77.60	0.15	6782	-108
115	peak 6932	78.00	0.40	6932	150
116	inflect up	78.40	0.40	6600	-332
117	inflect down	78.85	0.45	6400	-200
118	inflect up	79.30	0.45	6090	-310
119	dip	79.70	0.40	6090	0
120	peak	80.10	0.40	6250	160
121	dip	80.40	0.30	6160	-90
122	Spring Mtn 6306	80.85	0.45	6306	146
123	inflect up	81.10	0.25	6100	-206
124	saddle	81.50	0.40	5860	-240
125	inflect level 6034	81.70	0.20	6034	174
126	inflect up	82.35	0.65	5980	-54
127	peak 6252	82.50	0.15	6252	272
128	Cayuse Junction 5342	84.20	1.70	5342	-910
129	inflect up	85.10	0.90	6050	708
130	inflect down	85.90	0.80	6810	760
131	The Chief (Mt. Marcy)	86.15	0.25	6890	80
132	saddle	86.75	0.60	6430	-460
133	inflect down	86.95	0.20	6650	220
134	peak 6879	87.20	0.25	6879	229
135	Saddle	87.50	0.30	6660	-219
136	peak 6934	87.85	0.35	6934	274

137	slight dip 6723	88.10	0.25	6735	-199
138	slight peak 6882	89.10	1.00	6882	147
139	Saddle	89.60	0.50	6740	-142
140	peak	90.05	0.45	7000	260
141	Saddle	90.50	0.45	6620	-380
142	sharp peak 6888	90.75	0.25	6850	230
143	inflect up (at saddle)	91.35	0.60	6350	-500
144	inflect level	92.10	0.75	6150	-200
145	inflect down	92.50	0.40	6150	0
146	Papoose Saddle	93.00	0.50	5647	-503
147	inflect level 6130	93.45	0.45	6130	483
148	inflect down 6125	93.75	0.30	6125	-5
149	"Saddle 5872, Powell Jct. Rd"	93.95	0.20	5872	-253
150	inflect level	94.45	0.50	5920	48
151	inflect down	95.10	0.65	5920	0
152	Saddle 5466	95.65	0.55	5466	-454
153	peak	95.95	0.30	5620	154
154	dip	96.05	0.10	5500	-120
155	inflect down	96.35	0.30	5740	240
156	inflect up	96.70	0.35	5860	120
157	Rocky Point 6280	97.00	0.30	6280	420
158	inflect up	97.40	0.40	5870	-410
159	inflect level	97.55	0.15	5750	-120
160	curve down 5785	98.25	0.70	5785	35
161	Crooked Fork	0.25	2.00	3970	-1815
162	inflect up	101.00	0.75	4840	870
163	inflect down	101.35	0.35	5360	520
164	inflect up	102.00	0.65	5500	140
165	inflect level	102.30	0.30	5640	140

166	inflect down 5661	102.65	0.35	5640	0
167	Pack Creek	103.95	1.30	5140	-500
168	L&C Glade Creek Camp	104.05	0.10	5150	10
169	Cross Pack Creek	105.45	1.40	5199	49
170	Lolo Pass (circa 1912)	106.05	0.60	5254	55
171	dip (West Fork Lolo Cr.)	106.30	0.25	5190	-64
172	inflect down	107.00	0.70	5410	220
173	Wagon Mountain	107.40	0.40	5570	160
174	inflect down	108.20	0.80	5490	-80
175	inflect down	109.85	1.65	4900	-590
176	West Fork Lolo Creek	110.35	0.50	4241	-659
177	peak	110.90	0.55	4600	359
178	inflect up	111.90	1.00	4200	-400
179	inflect level	112.10	0.20	4160	-40
180	Lolo Hot Springs	112.45	0.35	4150	-10
181	inflect down	112.55	0.10	4360	210
182	peak	112.70	0.15	4410	50
183	dip	112.90	0.20	4140	-270
184	L&C Camp 09/12/05	113.60	0.70	4230	90
185	peak	113.75	0.15	4270	40
186	2 Fords of Lo Lo Creek	114.60	0.85	4045	-225
187	inflect up steeply 4034	114.95	0.35	4040	-5
188	inflect down	115.65	0.70	4900	860
189	inflect level	116.30	0.65	5160	260
190	inflect up	116.85	0.55	5180	20
191	peak	117.30	0.45	5240	60
192	dip	117.70	0.40	4800	-440
193	peak	118.10	0.40	4840	40
194	inflect down	119.25	1.15	4500	-340

195	Mullans Camp (Howard Cr.)	120.25	1.00	3860	-640
196	peak	120.45	0.20	3970	110
197	dip (Creek from North)	121.35	0.90	3875	-95
198	peak	121.45	0.10	3935	60
199	Hungry Creek	121.70	0.25	3835	-100
200	Grave Creek	122.45	0.75	3790	-45
201	peak	122.60	0.15	4090	300
202	dip	122.95	0.35	3945	-145
203	peak	123.15	0.20	4055	110
204	dip	123.35	0.20	4015	-40
205	inflect level	123.45	0.10	4105	90
206	inflect down	123.65	0.20	4105	0
207	Clark Creek	123.95	0.30	3945	-160
208	peak	124.35	0.40	4250	305
209	Potato Gulch	124.85	0.50	4095	-155
210	peak	125.15	0.30	4225	130
211	Sheldon Creek	125.65	0.50	4065	-160
212	peak	126.05	0.40	4175	110
213	Smith Creek	126.50	0.45	4105	-70
214	peak	126.75	0.25	4175	70
215	Bear Creek	127.15	0.40	3760	-415
216	peak	127.45	0.30	4100	340
217	Camp Creek	127.70	0.25	3840	-260
218	inflect up	127.95	0.25	3885	45
219	peak	128.25	0.30	3980	95
220	dip	128.40	0.15	3920	-60
221	peak	128.55	0.15	4020	100
222	Woodman Creek 3542	129.65	1.10	3580	-440
223	L&C Camp 11/11/05	132.05	2.40	3460	-120

224	inflect down	133.95	1.90	3390	-70
225	inflect up 3356	134.65	0.70	3356	-34
226	Elev. Ref.	137.65	3.00	3240	-116
227	L&C Camp 6/30/06	138.65	1.00	3200	-40
228	Bitter Root River	140.45	1.80	3155	-45

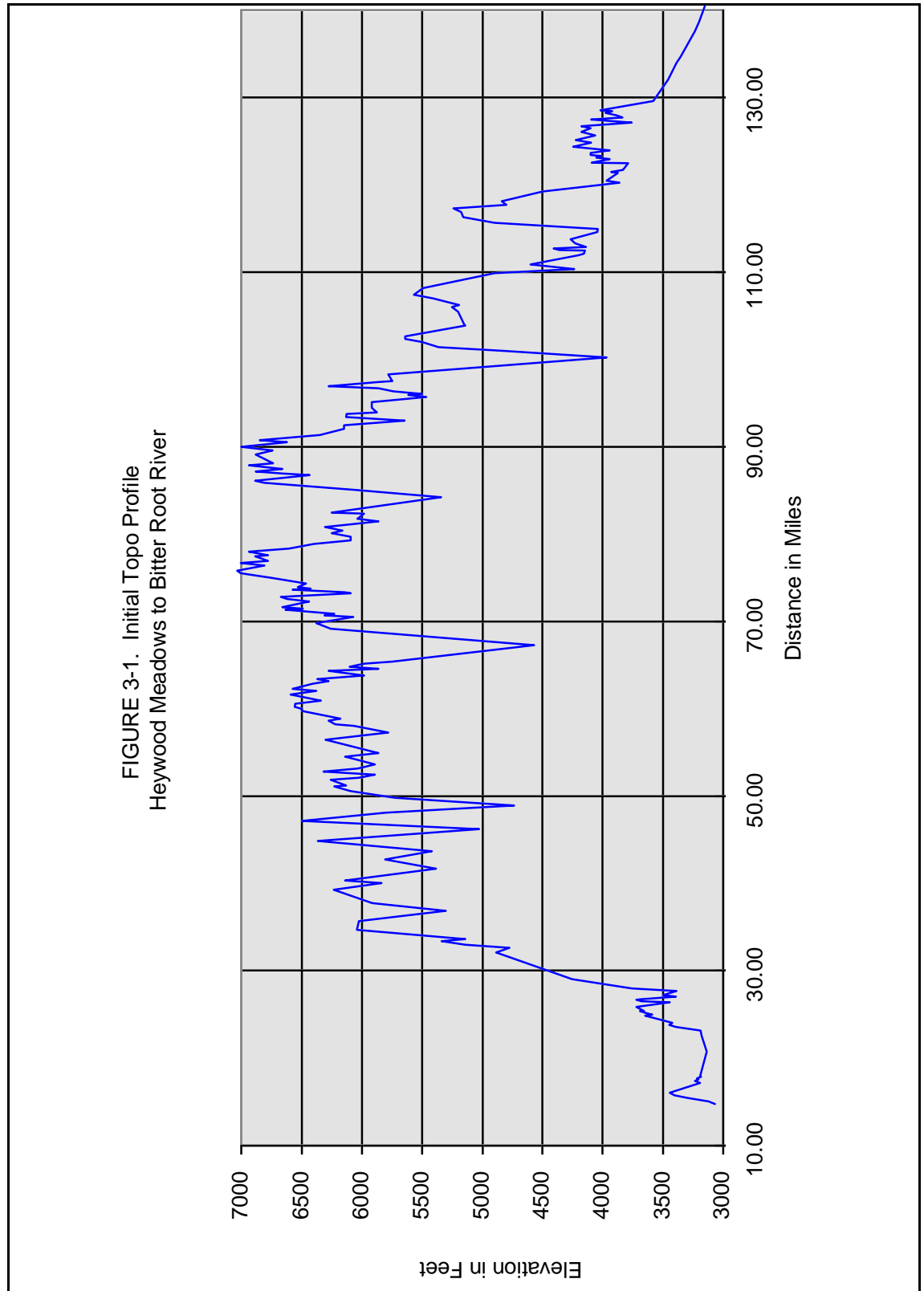


Figure 3-1 Entire initial topographic profile - Heywood Meadows to Bitter Root River.

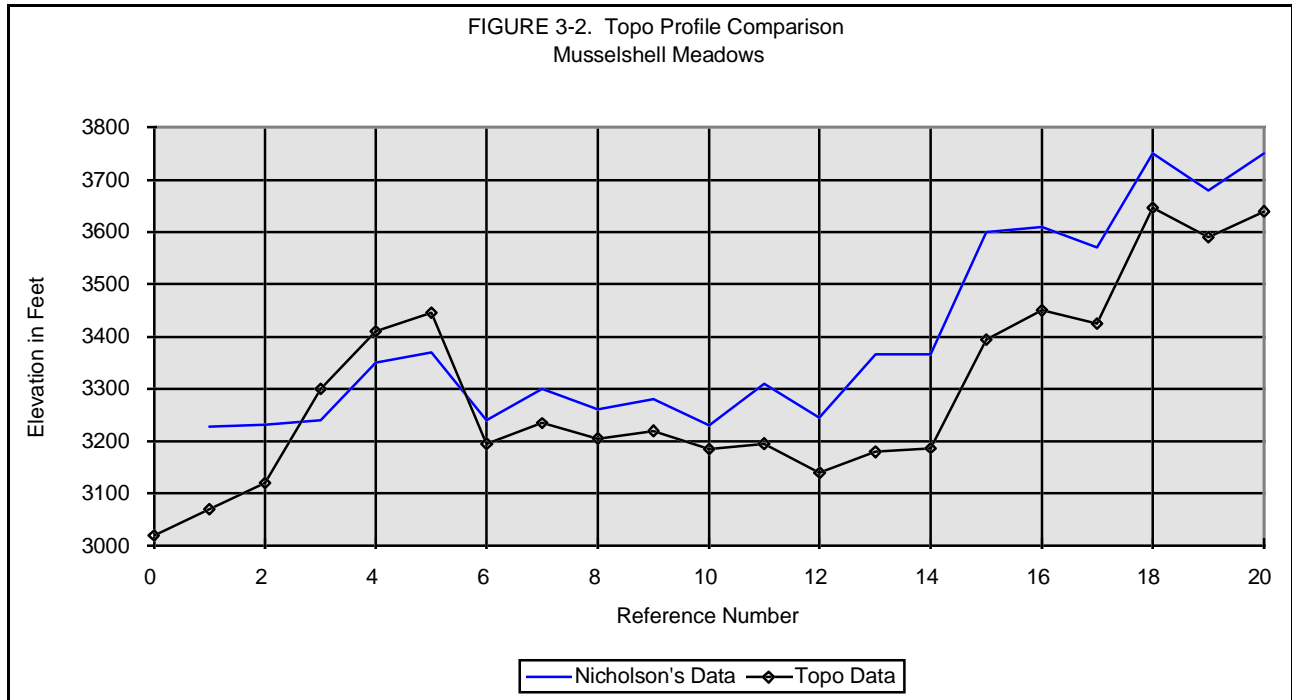


Figure 3-2 Initial topographic profile comparison - Musselshell Meadows

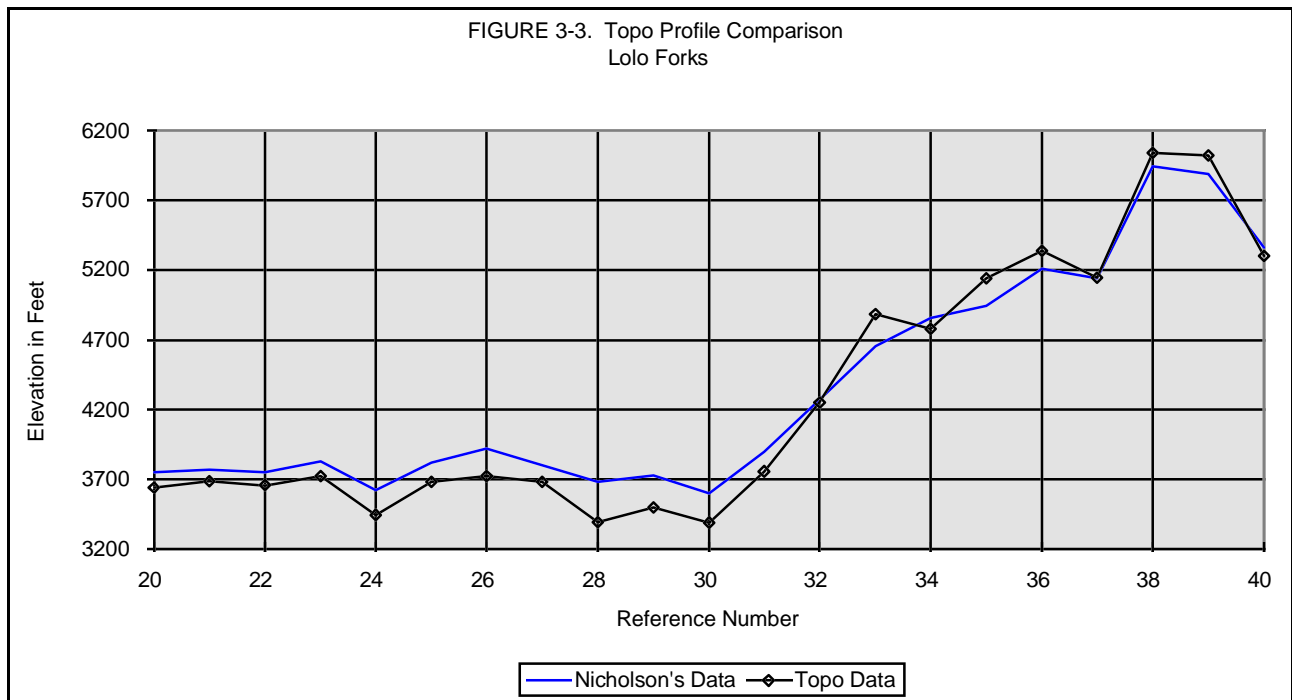


Figure 3-3 Initial topographic profile comparison - Lolo Forks.

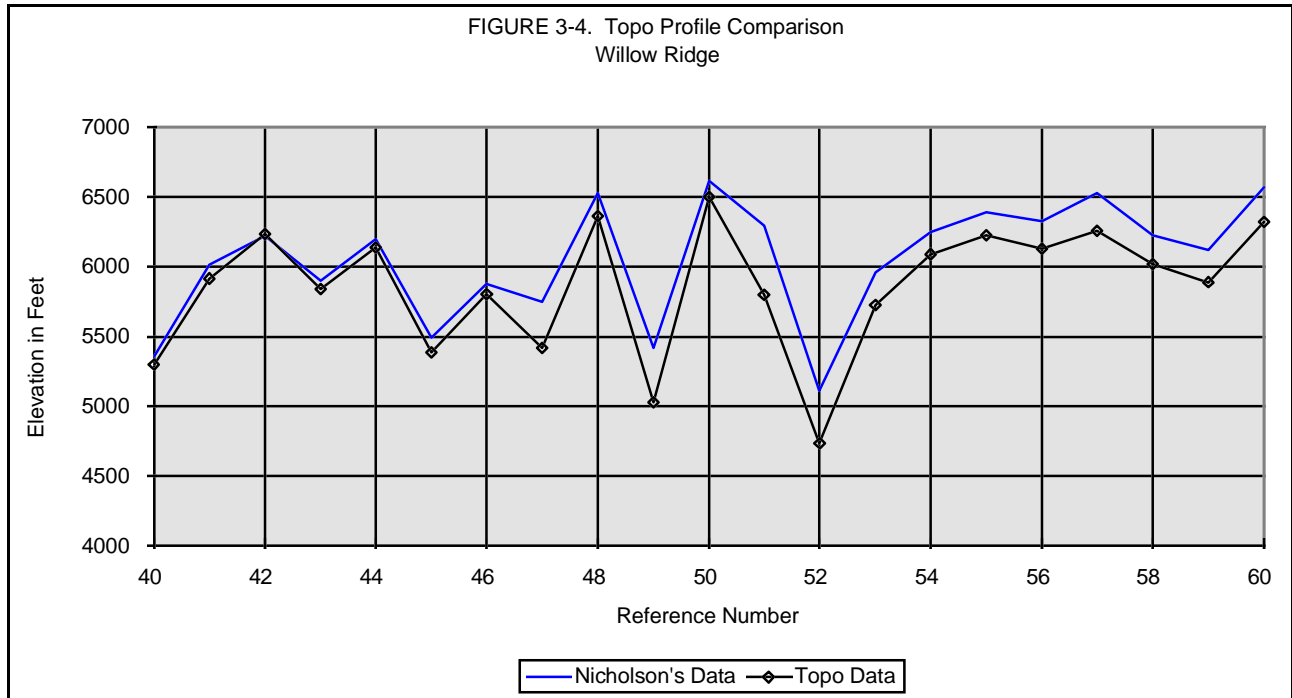


Figure 3-4 Initial topographic profile comparison - Willow Ridge.

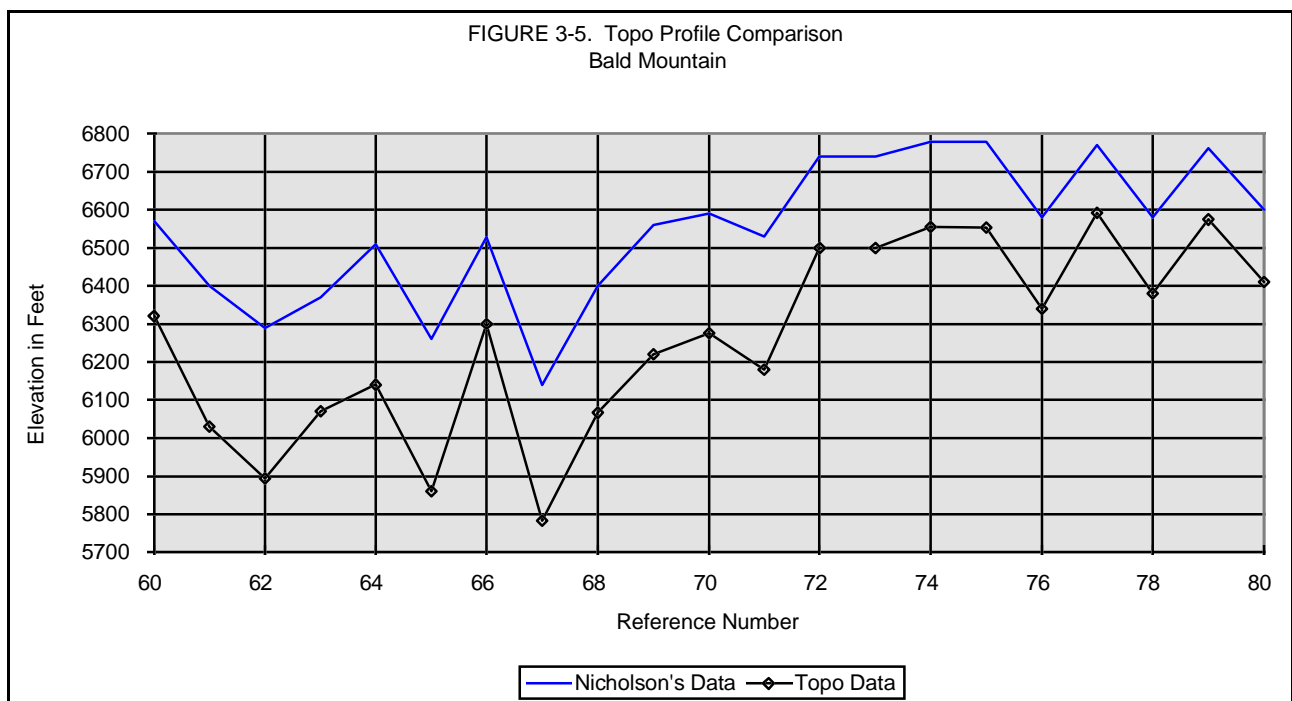


Figure 3-5 Initial topographic profile comparison - Bald Mountain.

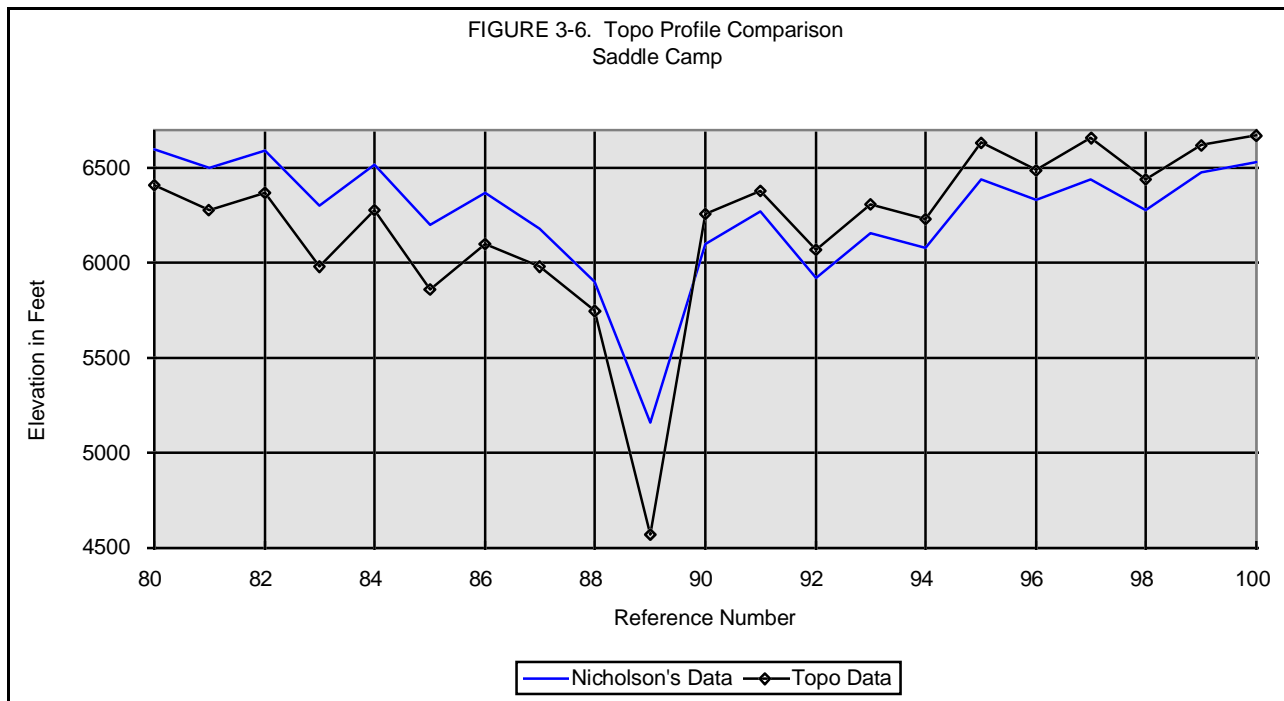


Figure 3-6 Initial topographic profile comparison - Saddle Camp.

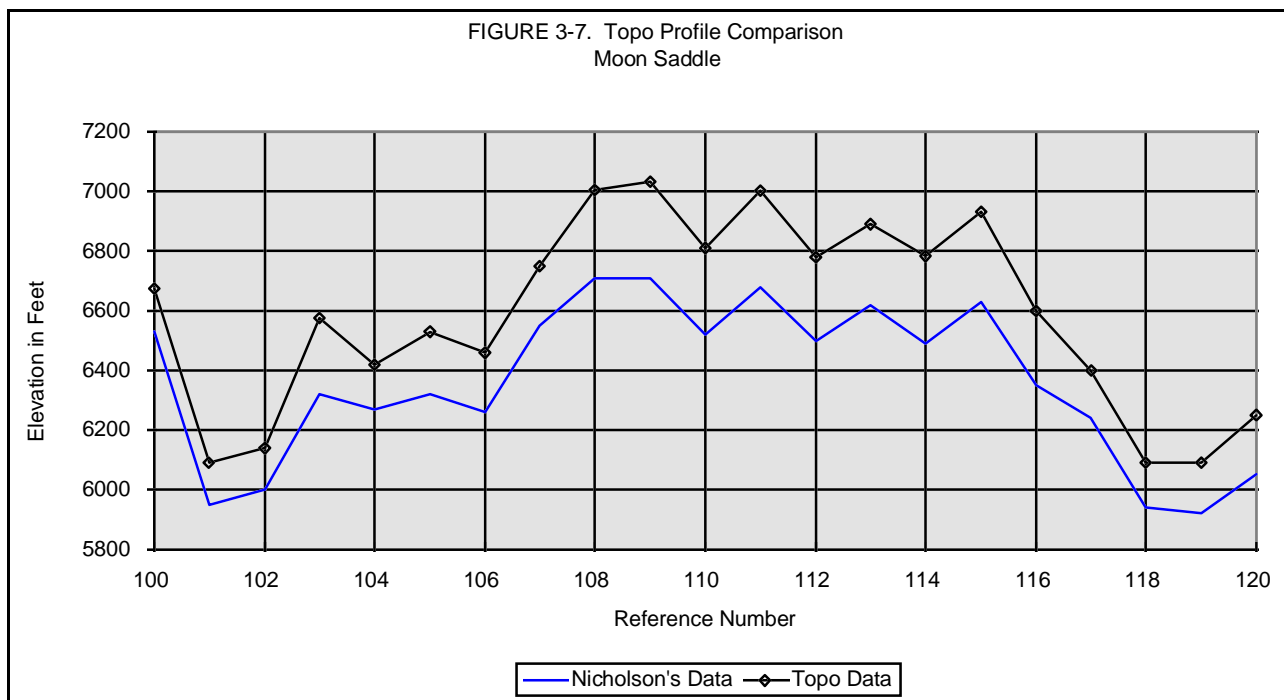


Figure 3-7 Initial topographic profile comparison - Moon Saddle

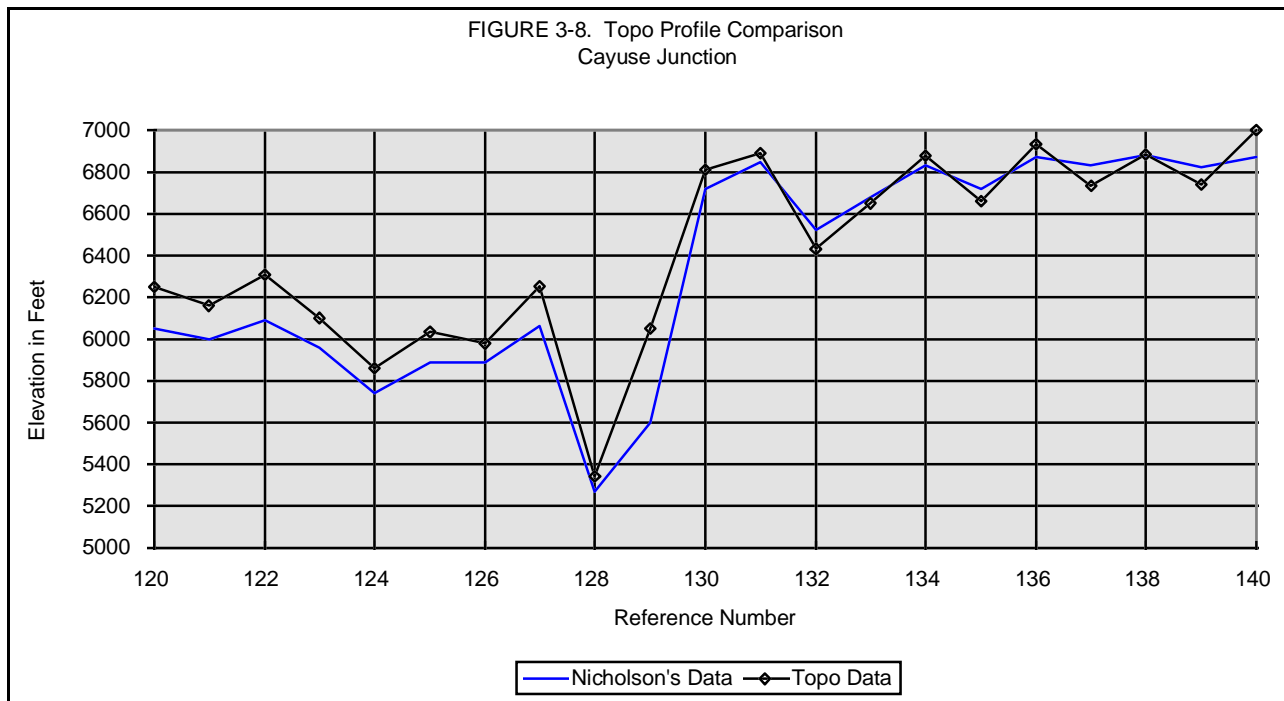


Figure 3-8 Initial topographic profile comparison - Cayuse Junction.

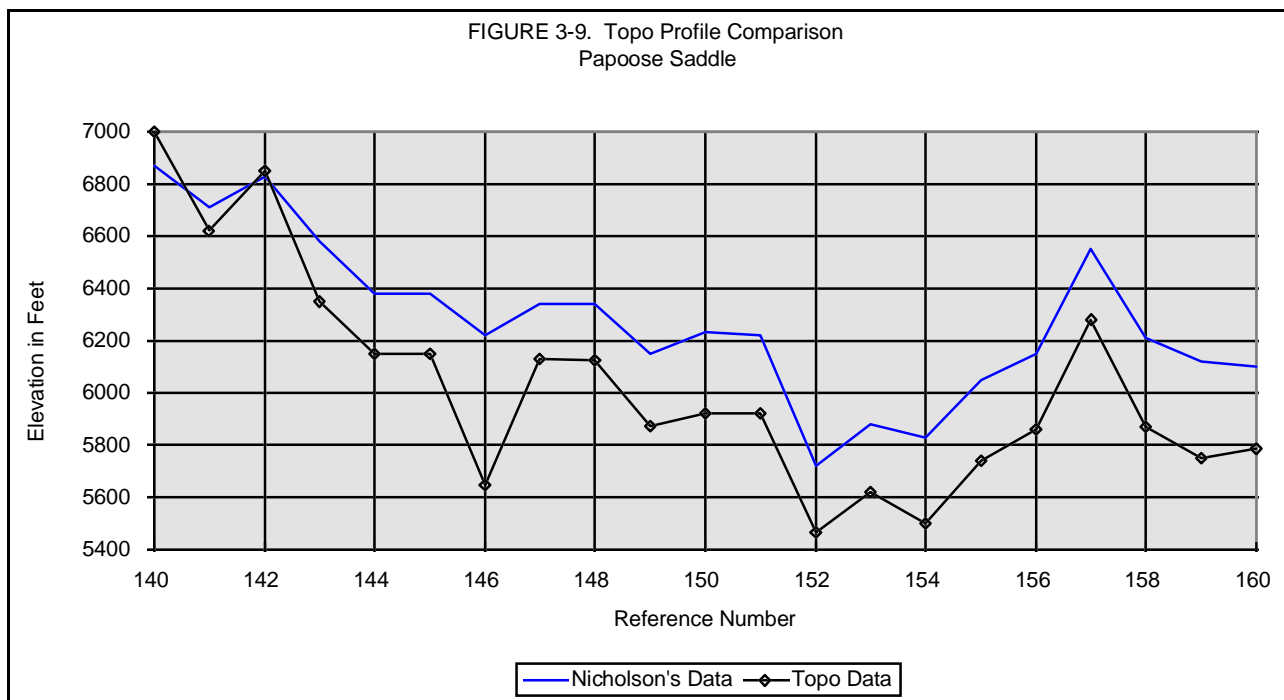


Figure 3-9 Initial topographic profile comparison - Papoose Saddle.

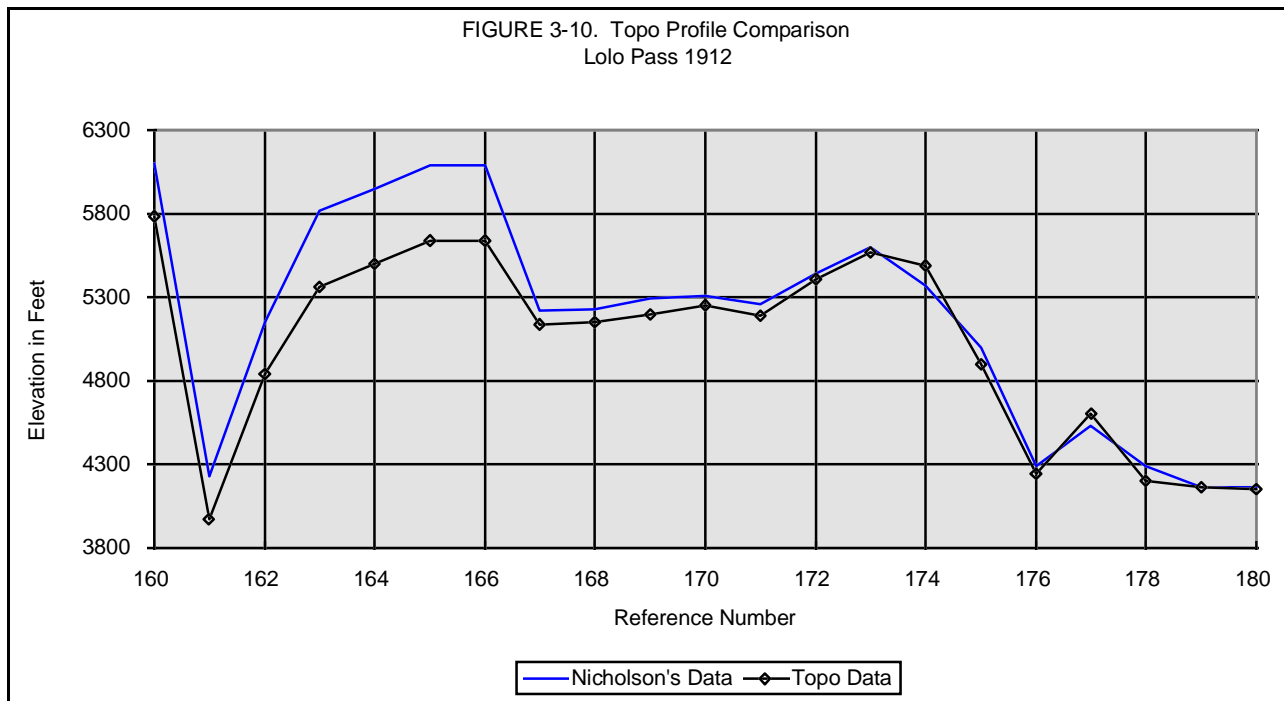


Figure 3-10 Initial topographic profile comparison - Lolo Pass 1912

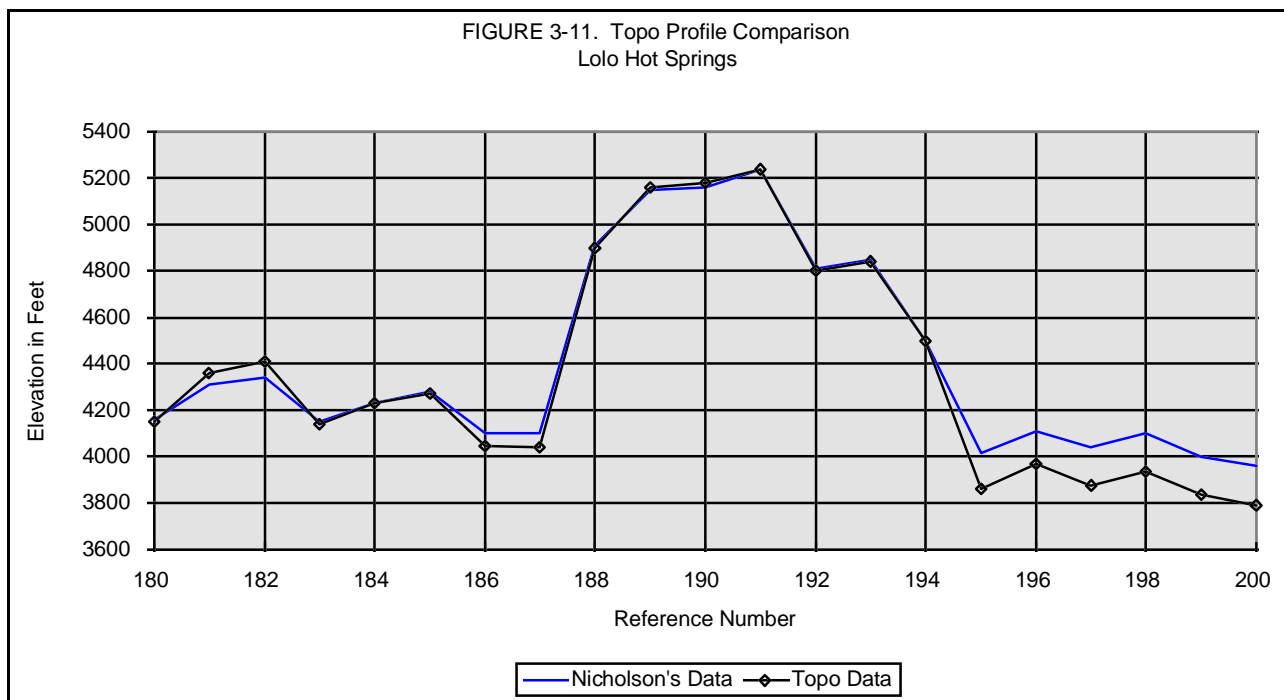


Figure 3-11 Initial topographic profile comparison - Lolo Hot Springs.

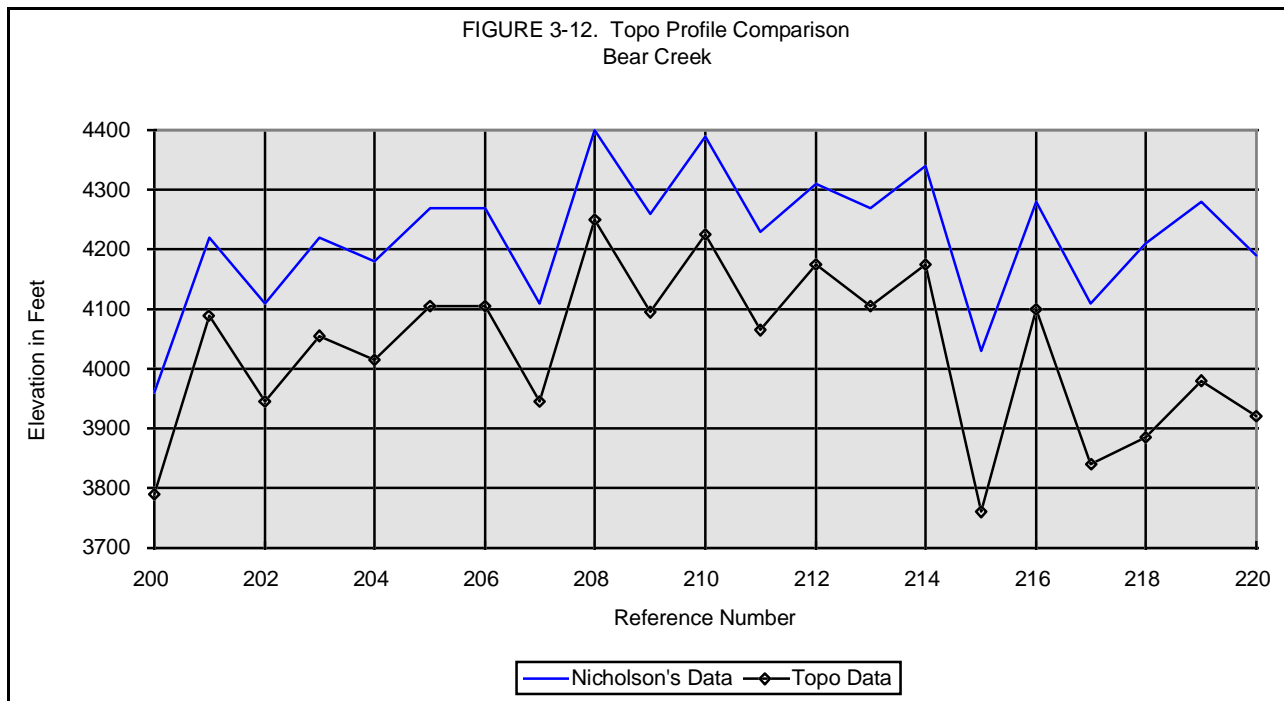


Figure 3-12 Initial topographic profile comparison - Bear Creek

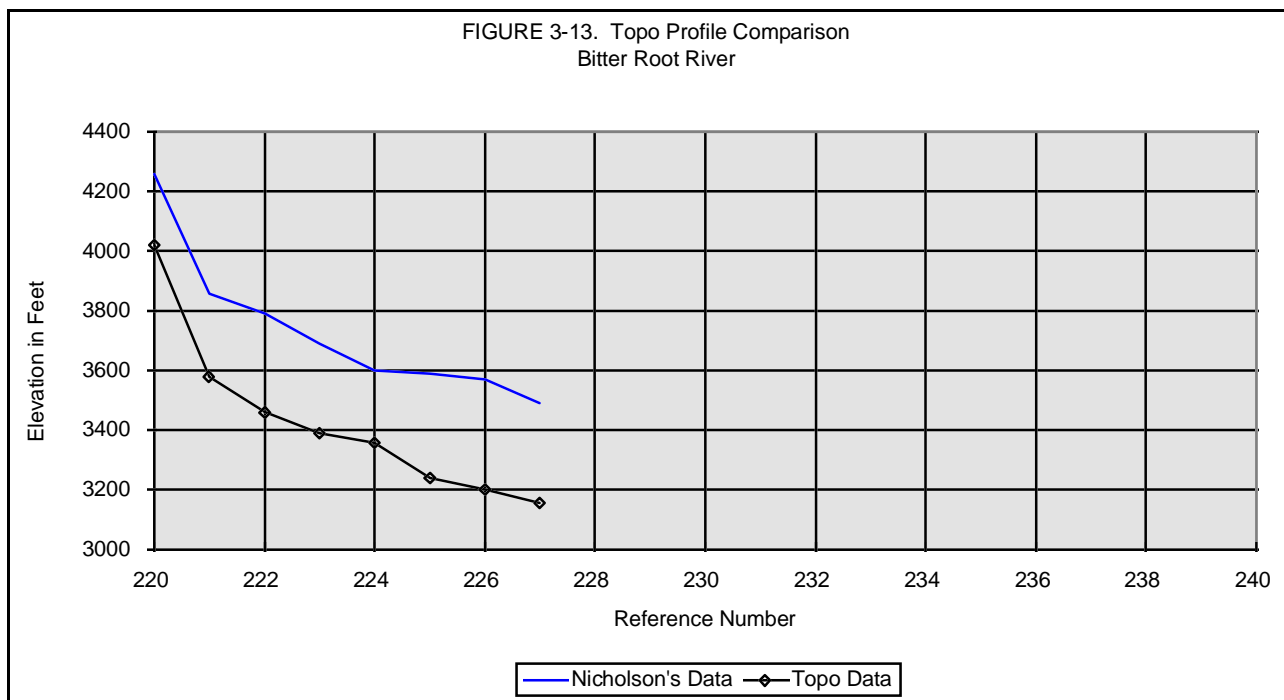


Figure 3-13 Initial topographic profile comparison - Bitter Root River.

4. APPROACH TO THE ANALYSIS OF DATA

To achieve the goal of accurately locating the tread of the Northern Nez Perces Trail, it is necessary to understand the nature of the errors that might occur in the Nicholson data and develop scientific methods of compensating for them. The following errors and their likely causes are noted:

1. Elevation Errors. Elevation measurements were taken with two types of barometric altimeters, a mercurial barometer and an aneroid barometer. The extant reports and maps do not always make it clear which instrument was used for each measurement. If, in producing the maps and reports, the readings on the two instruments were not correlated and corrected, there could be considerable error introduced. One of the largest sources of error associated with barometric methods is the change in barometric pressure due to weather changes. From the reports and maps, it is not clear if any attempt was made to correct for day-to-day changes in nominal barometric pressure.
2. Distance Errors. Distances for the maps prepared by Nicholson in 1898 were from 1866 data that were estimated by timing the rate of travel on horseback. The distances he reports have several identifiable errors in them but are still reasonably accurate for locating the trail tread. On his 1866 map, Nicholson reports that the Virginia City Lewiston Wagon Road survey was done with surveyor's compass and chain between Weippe Prairie and Lolo Pass. However, this information was not used as the basis for the 1898 profile map.
3. Gross Errors. These are errors that occur due to mistakes in reading the instruments and making, or entering, calculations. Gross errors are to be expected whenever a large amount of data has to be processed and presented. They can often be detected by trend analysis and corrected with the use of interpolation or *a priori* knowledge.

Two specific errors that Nicholson noted in his descriptions are:

1. The profile data between Heywood Meadows and Musselshell Meadows is a crude estimate and of limited usefulness. Nicholson noted this on his profile map by using dotted lines.
2. The profile data between Lolo Forks and Snowy Summit is very inaccurate with the distances being too large and the undulations being omitted. Nicholson commented about this inaccuracy directly on his profile map.

Some specific errors that were detected because of the author's extensive work on the Bird-Truax trail are:

1. The elevation and distance reference given for Oyipe Prairie corresponds to Heywood Meadows and not the Weippe Prairie. Nicholson's detailed map of the area clearly shows this. However, all the other journal references used by this author have used the term "Oyipe Prairie" to refer to the Weippe Prairie.
2. The elevation for Snow Bridge Gulch does not agree with adjacent profile data. The reported elevation much better fits the profile westward than the profile eastward. However, if the estimate for the Snow Bridge Gulch elevation is increased, the resulting eastward profile accurately fits the profiles around Howard Camp and Moon Saddle. It could be that there was a

layover on Serpent Creek during the passing of a major storm front. The wagon road reports and the Lewis & Clark Journals do not help to clarify this issue.

3. The elevation recorded for Papoose Saddle is in question. There seems to be a gross error involved. The profile map, other maps, and the wagon road reports all disagree. It appears that there are no extant records that will help resolve this. It will have to be dealt with as an unresolvable gross error.
4. The first elevation inflection point eastward from Cayuse Junction is in gross error. The wagon road reports give an accurate value so this value is used in the analysis.
5. It was observed that, for large elevation changes between saddle and peaks, the amount of change reported by Nicholson is almost always smaller than the actual elevation change. It seems intuitive that the trail could short-cut the peaks but not the saddles and, for this reason, the saddles are more frequently used as elevation points-of-reference when doing corrections.
6. It appears that corrections for changes in nominal barometric pressure, due to changing weather, were not made for most, if not all, of the measurements.

The approach to analyzing Nicholson's profile map is described as follows:

1. The Nicholson data and the initial topographic data were entered into the same spreadsheet for ease of data manipulation.
2. A comparison of the two sets of data was made and it was noted that there were linear trends and step changes (average-value changes) in the elevation differences. These trends and step changes were estimated using piecewise linear regression.
3. The elevation differences estimated with linear regression were subtracted from the Nicholson elevation data to produce a first estimate of the corrected Nicholson data. These corrections should compensate for elevation errors caused by barometric pressure changes.
4. Similar correction methods were applied to the distance data. A strong trend toward a simple scale factor error was noted and corrected using simple linear regression.
5. A second spreadsheet was then programmed to: 1) make individual elevation point corrections to Nicholson's elevation data, 2) make individual elevation point corrections to the initial topographic data, 4) compute the elevation difference between the two sets of data, 3) compute the elevation change between adjacent reference points, 5) compute the total distance and distance change between adjacent reference points, and 6) compute the elevation change difference between the two sets of data.
6. Gross errors were compensated by entering the correct elevation value if it could be determined by other means.

5. INITIAL ANALYSIS OF DATA

5.1 Analysis of Elevation Data

While studying the comparisons in the plots of **Figures 3-2** through **3-13**, it became apparent that step changes in elevation were occurring in the Nicholson data. This not an unexpected result for barometric elevation measurements that occur over a span of several hours or days. To begin, average-value corrections were made to groups of data as follows:

1. The elevation difference between Nicholson data and Topo data was computed for each reference point by subtracting the Topo value from the Nicholson value.
2. Next, reference points were grouped according to a visual estimation of where the step changes occurred. This estimate was aided by trying various groupings and adding or subtracting a fixed elevation and comparing the plotted elevation differences. These groupings are given in **Table 5-1** below.
3. Next, the average value of each group was computed for an estimate of the average elevation difference.
4. Then, the average elevation differences were subtracted, point by point, from the Nicholson's initial data to produce the initial corrected Nicholson elevation data.
5. Finally, the Topo elevation data was subtracted, point by point, from the corrected Nicholson data to produce the corrected elevation difference.

Next, three gross elevation errors were noted,

1. Reference Point 89, Snow Bridge Gulch {Serpent Creek}.
2. Reference Point 129, inflect up. {Cayuse Junction}
3. Reference Point 146, Camp Independence {Papoose Saddle}.

The gross error at Snow Bridge Gulch was initially compensated by locating the lowest elevation point just above the forks of Serpent and Gravey Creeks. The justification for this came from the Bird-Truax wagon road reports and from the Lewis & Clark Journals. The error at No. 129 was corrected using the reported elevation in the wagon road reports. The elevation at Camp Independence was corrected using Nicholson's table of camping places in the wagon road reports.

Table 5-1. Reference number ranges where the occurrence of elevation step changes (average-value changes) were determined from observations of the graphs of Chapter 3.

Reference Number Range	Reference Name
1 - 3	Oyipe Prairie {Heywood Meadows}
3 - 5	inflect up
6 -10	dip
11 - 30	peak
31 - 46	inflect up
47 - 89	dip {Green Saddle}
90 - 104	inflect down
105 - 127	peak {Peak 6530}
128 - 162	Lake Templin {Cayuse Junction 5347}
163 - 166	inflect down
167 - 193	Glade Creek {Pack Creek}
194 - 213	Mullans Camp {Mullans Camp 3851}
214 - 228	Large Creek {Bear Creek}

Table 5-2 shows the spreadsheet results for the average value correction for these elevation step changes. Column 1 shows the reference point number. Column 2 marks the locations of the step changes in barometric elevation. Column 3 shows the initial elevation differences between the Nicholson data points and the Topo data points. Column 4 shows the average value that was subtracted from the Nicholson elevation data to produce Column 5, the corrected Nicholson elevation points that will be initially used for further analysis. Column 6 shows the initial Topo Elevation points for a comparison with the initial corrected Nicholson points. Column 7 is the elevation difference between the initial corrected Nicholson elevations and the initial Topo Elevations.

Figure 5-1. Initial corrected Nicholson Profile. This figure shows the entire Nicholson elevation profile after it was corrected for step changes in elevation. The distance reference is the Topo distance of Column 3, in **Table 3-1** which are the Topo distances referenced to Beaver Dam Saddle as 36.85 miles. This plot can be visually compared to Figure 3-1 where we see that, on this large scale, excellent agreement is obtained.

Figures 5-2 through 5-13. These figures were prepared to show the agreement on a much finer scale. These plots show the initial (step) corrected Nicholson elevation, Column 5, and the initial Topo elevation, Column 6, as a function of reference number. As before, reference number is used to give an exact location comparison. These plots also show very good agreement between the Nicholson elevations and the elevations corresponding to the tread location that was initially selected.

Table 5-2. Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes (Figures 5-1 through 5-13).

> = Step Trend Change

@ = Gross Error Edit

Dir: e:\user\steve\trails\lolotral\research\birdtrue\nicholson
File: profile2.wk1 ("page 1") (Lotus)

Ref. Number	Initial Elevation Difference	Average Value Curve Fit	Initial Corrected Nicholson Elevation	Initial Topo Elevation	Corrected Elevation Difference
1	2 3	4	5	6	7 8
0				3020	
1	> 158	135	3093	3070	23
2	112	135	3097	3120	-23
3	> -60	-65	3305	3300	5
4	-60	-65	3415	3410	5
5	-75	-65	3435	3445	-10
6	> 45	54	3186	3195	-9
7	65	54	3246	3235	11
8	55	54	3206	3205	1
9	60	54	3226	3220	6
10	45	54	3176	3185	-9
11	> 115	152	3158	3195	-37
12	105	152	3093	3140	-47
13	187	152	3215	3180	35
14	180	152	3215	3187	28
15	205	152	3448	3395	53
16	160	152	3458	3450	8
17	146	152	3418	3424	-6
18	104	152	3598	3646	-48
19	90	152	3528	3590	-62
20	110	152	3598	3640	-42

21	80	152	3618	3690	-72
22	90	152	3598	3660	-62
23	105	152	3678	3725	-47
24	175	152	3468	3445	23
25	140	152	3668	3680	-12
26	195	152	3768	3725	43
27	120	152	3648	3680	-32
28	285	152	3528	3395	> 133
29	230	152	3578	3500	78
30	211	152	3448	3389	59
31	> 140	-6	3906	3760	> 146
32	19	-6	4276	4251	25
33	-226	-6	4665	4885	> -220
34	80	-6	4866	4780	86
35	-200	-6	4946	5140	> -194
36	-130	-6	5216	5340	> -124
37	-4	-6	5146	5144	2
38	-96	-6	5950	6040	-90
39	-130	-6	5896	6020	> -124
40	58	-6	5366	5302	64
41	101	-6	6021	5914	> 107
42	-15	-6	6226	6235	-9
43	60	-6	5906	5840	66
44	60	-6	6206	6140	66
45	105	-6	5496	5385	> 111
46	75	-6	5886	5805	81
47	> 330	270	5481	5420	61
48	167	270	6263	6365	> -103
49	393	270	5151	5027	> 124

50	116	270	6347	6500	> -154
51	499	270	6031	5801	> 230
52	373	270	4841	4737	> 104
53	235	270	5691	5725	-35
54	160	270	5981	6090	> -110
55	160	270	6121	6230	> -110
56	200	270	6061	6130	-70
57	270	270	6261	6260	1
58	210	270	5961	6020	-60
59	230	270	5851	5890	-40
60	250	270	6301	6320	-20
61	370	270	6131	6030	> 101
62	396	270	6021	5894	> 127
63	300	270	6101	6070	31
64	370	270	6241	6140	> 101
65	400	270	5991	5860	> 131
66	228	270	6259	6300	-42
67	358	270	5871	5782	89
68	334	270	6131	6066	65
69	340	270	6291	6220	71
70	314	270	6321	6276	45
71	350	270	6261	6180	81
72	240	270	6471	6500	-30
73	240	270	6471	6500	-30
74	225	270	6511	6555	-45
75	226	270	6511	6554	-44
76	240	270	6311	6340	-30
77	178	270	6501	6592	-92
78	200	270	6311	6380	-70

79	186	270	6491	6574	-84
80	190	270	6331	6410	-80
81	220	270	6231	6280	-50
82	220	270	6321	6370	-50
83	320	270	6031	5980	51
84	241	270	6251	6279	-29
85	340	270	5931	5860	71
86	271	270	6101	6099	2
87	200	270	5911	5980	-70
88	150	270	5631	5750	> -120
89	@ 350	270	4651	4570	81
89	@ 350	270	4651	4570	81
90	> -160	-161	6261	6260	1
91	-110	-161	6431	6380	51
92	-150	-161	6081	6070	11
93	-148	-161	6321	6308	13
94	-150	-161	6241	6230	11
95	-195	-161	6601	6635	-34
96	-160	-161	6491	6490	1
97	-218	-161	6601	6658	-57
98	-161	-161	6441	6441	0
99	-140	-161	6641	6620	21
100	-143	-161	6691	6673	18
101	-140	-161	6111	6090	21
102	-140	-161	6161	6140	21
103	-255	-161	6481	6575	-94
104	-150	-161	6431	6420	11
105	> -210	-216	6536	6530	6
106	-200	-216	6476	6460	16

107	-200	-216	6766	6750	16
108	-295	-216	6926	7005	-79
109	-323	-216	6926	7033	> -107
110	-290	-216	6736	6810	-74
111	-324	-216	6896	7004	> -108
112	-280	-216	6716	6780	-64
113	-270	-216	6836	6890	-54
114	-292	-216	6706	6782	-76
115	-302	-216	6846	6932	-86
116	-250	-216	6566	6600	-34
117	-160	-216	6456	6400	56
118	-150	-216	6156	6090	66
119	-170	-216	6136	6090	46
120	-200	-216	6266	6250	16
121	-160	-216	6216	6160	56
122	-216	-216	6306	6306	0
123	-140	-216	6176	6100	76
124	-120	-216	5956	5860	96
125	-144	-216	6106	6034	72
126	-90	-216	6106	5980	> 126
127	-192	-216	6276	6252	24
128	> -70	-7	5279	5342	-63
129	@ -80	-7	5977	6050	-73
130	-90	-7	6727	6810	-83
131	-45	-7	6852	6890	-38
132	90	-7	6527	6430	97
133	30	-7	6687	6650	37
134	-49	-7	6837	6879	-42
135	60	-7	6727	6660	67

136	-64	-7	6877	6934	-57
137	95	-7	6837	6735	> 102
138	-2	-7	6887	6882	5
139	80	-7	6827	6740	87
140	-130	-7	6877	7000	> -123
141	90	-7	6717	6620	97
142	-20	-7	6837	6850	-13
143	> 230	277	6303	6350	-47
144	230	277	6103	6150	-47
145	230	277	6103	6150	-47
146	@ 220	277	5590	5647	-57
147	210	277	6063	6130	-67
148	215	277	6063	6125	-62
149	278	277	5873	5872	1
150	310	277	5953	5920	33
151	300	277	5943	5920	23
152	254	277	5443	5466	-23
153	260	277	5603	5620	-17
154	330	277	5553	5500	53
155	310	277	5773	5740	33
156	290	277	5873	5860	13
157	272	277	6275	6280	-5
158	340	277	5933	5870	63
159	370	277	5843	5750	93
160	315	277	5823	5785	38
161	259	277	3952	3970	-18
162	310	277	4873	4840	33
163	> 459	452	5367	5360	7
164	450	452	5498	5500	-2

165	450	452	5638	5640	-2
166	450	452	5638	5640	-2
167	> 79	19	5200	5140	60
168	80	19	5211	5150	61
169	93	19	5273	5199	74
170	56	19	5291	5254	37
171	70	19	5241	5190	51
172	30	19	5421	5410	11
173	30	19	5581	5570	11
174	-120	19	5351	5490	> -139
175	100	19	4981	4900	81
176	49	19	4271	4241	30
177	-70	19	4511	4600	-89
178	90	19	4271	4200	71
179	0	19	4141	4160	-19
180	10	19	4141	4150	-9
181	-50	19	4291	4360	-69
182	-70	19	4321	4410	-89
183	10	19	4131	4140	-9
184	***			4230	
185	10	19	4261	4270	-9
186	55	19	4081	4045	36
187	60	19	4081	4040	41
188	10	19	4891	4900	-9
189	-10	19	5131	5160	-29
190	-20	19	5141	5180	-39
191	0	19	5221	5240	-19
192	10	19	4791	4800	-9
193	10	19	4831	4840	-9

194	0	19	4481	4500	-19
195	> 156	160	3856	3860	-4
196	140	160	3950	3970	-20
197	165	160	3880	3875	5
198	165	160	3940	3935	5
199	165	160	3840	3835	5
200	170	160	3800	3790	10
201	130	160	4060	4090	-30
202	165	160	3950	3945	5
203	165	160	4060	4055	5
204	165	160	4020	4015	5
205	165	160	4110	4105	5
206	165	160	4110	4105	5
207	165	160	3950	3945	5
208	150	160	4240	4250	-10
209	165	160	4100	4095	5
210	165	160	4230	4225	5
211	165	160	4070	4065	5
212	135	160	4150	4175	-25
213	165	160	4110	4105	5
214	165	160	4180	4175	5
215	> 270	290	3740	3760	-20
216	180	290	3990	4100	> -110
217	270	290	3820	3840	-20
218	325	290	3920	3885	35
219	300	290	3990	3980	10
220	270	290	3900	3920	-20
221	240	290	3970	4020	-50
222	280	290	3570	3580	-10

223	330	290	3500	3460	40
224	300	290	3400	3390	10
225	244	290	3310	3356	-46
226	350	290	3300	3240	60
227	370	290	3280	3200	80
228	335	290	3200	3155	45

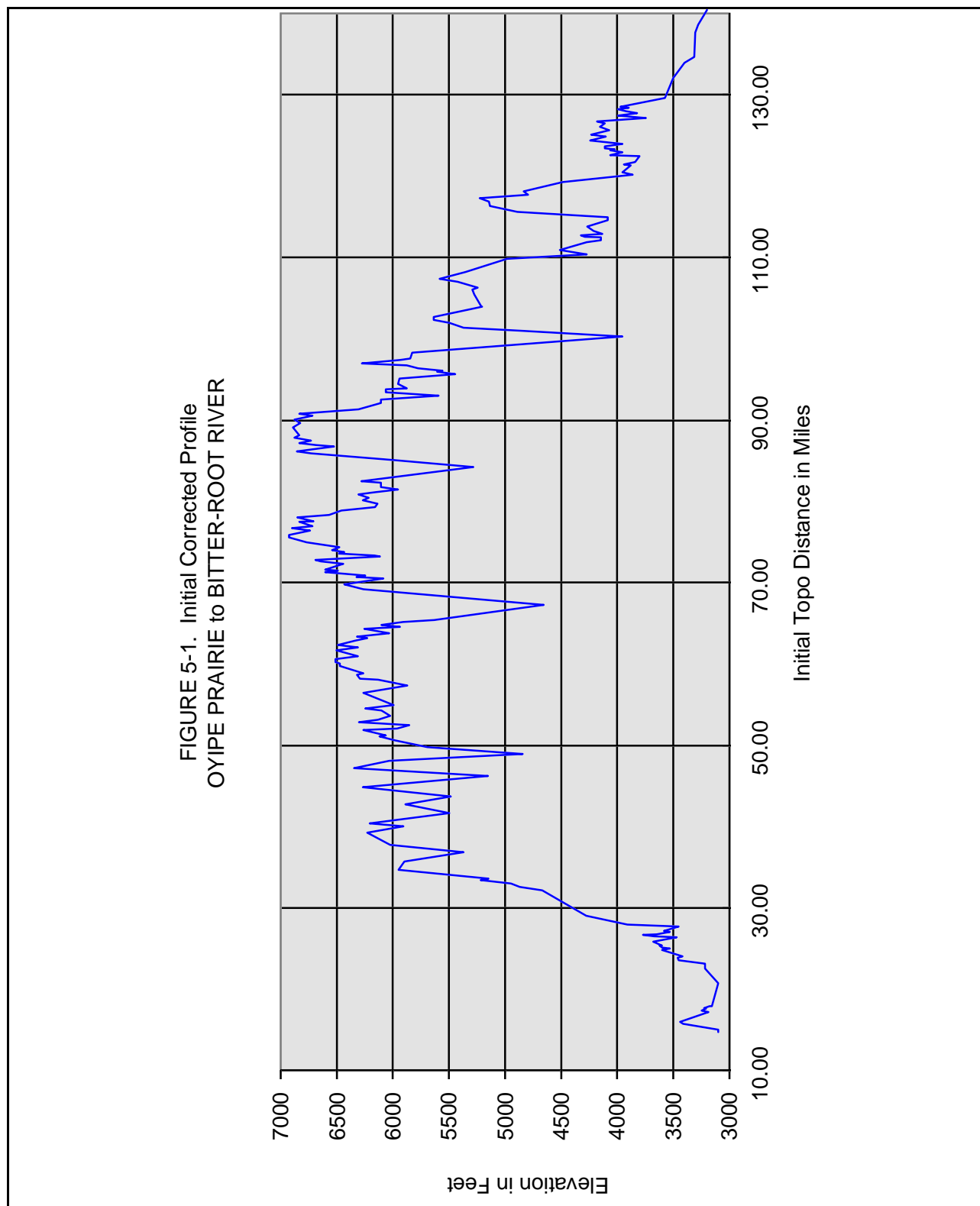


Figure 5-1 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Heywood Meadows to Bitter Root River.

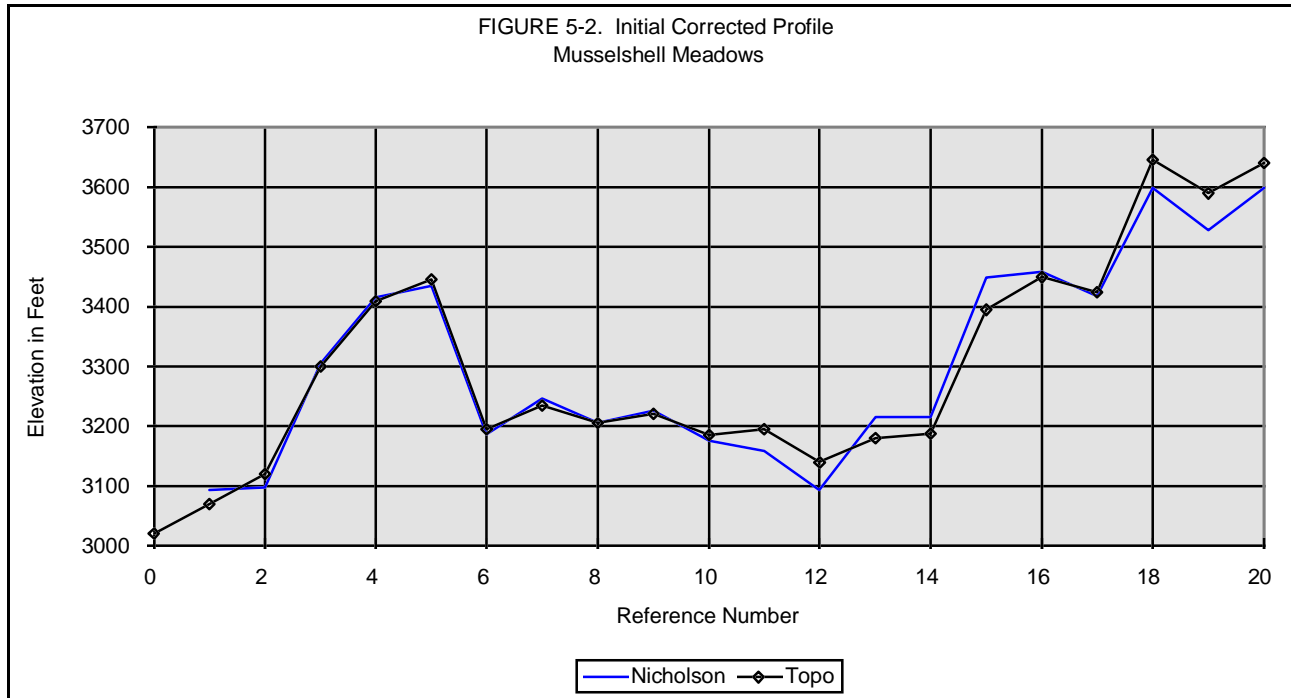


Figure 5-2 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Musselshell Meadows.

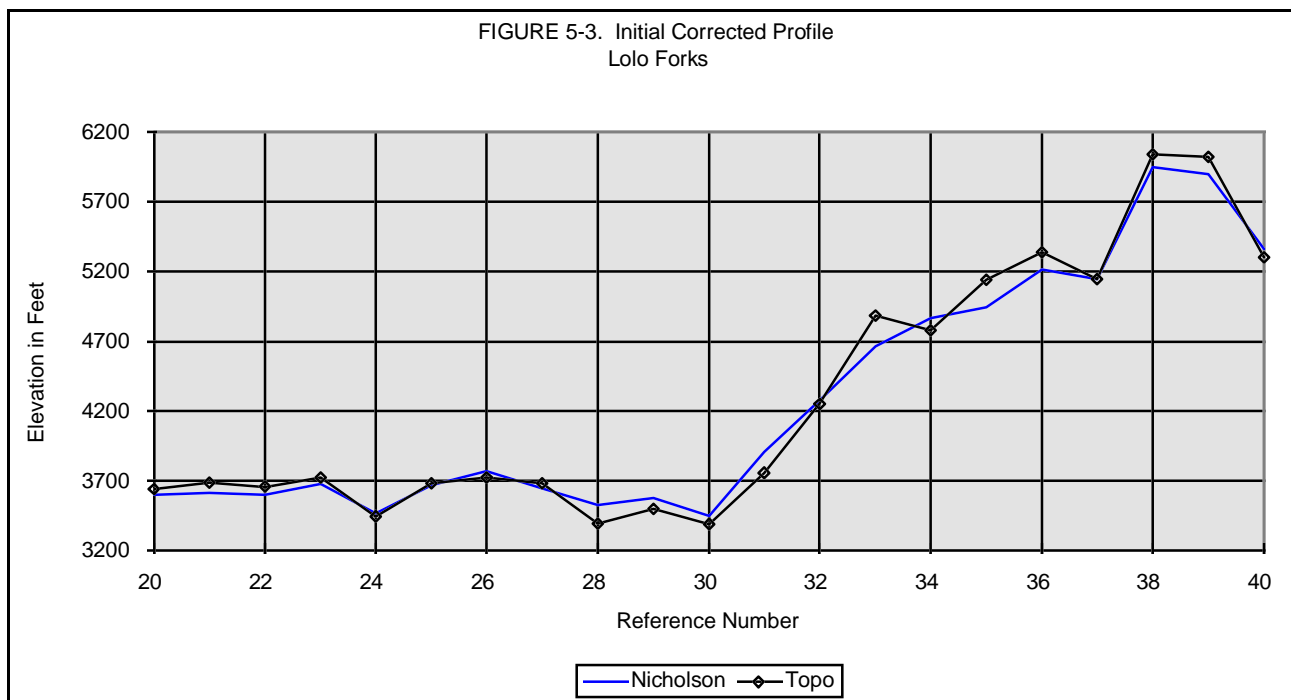


Figure 5-3 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Lolo Forks.

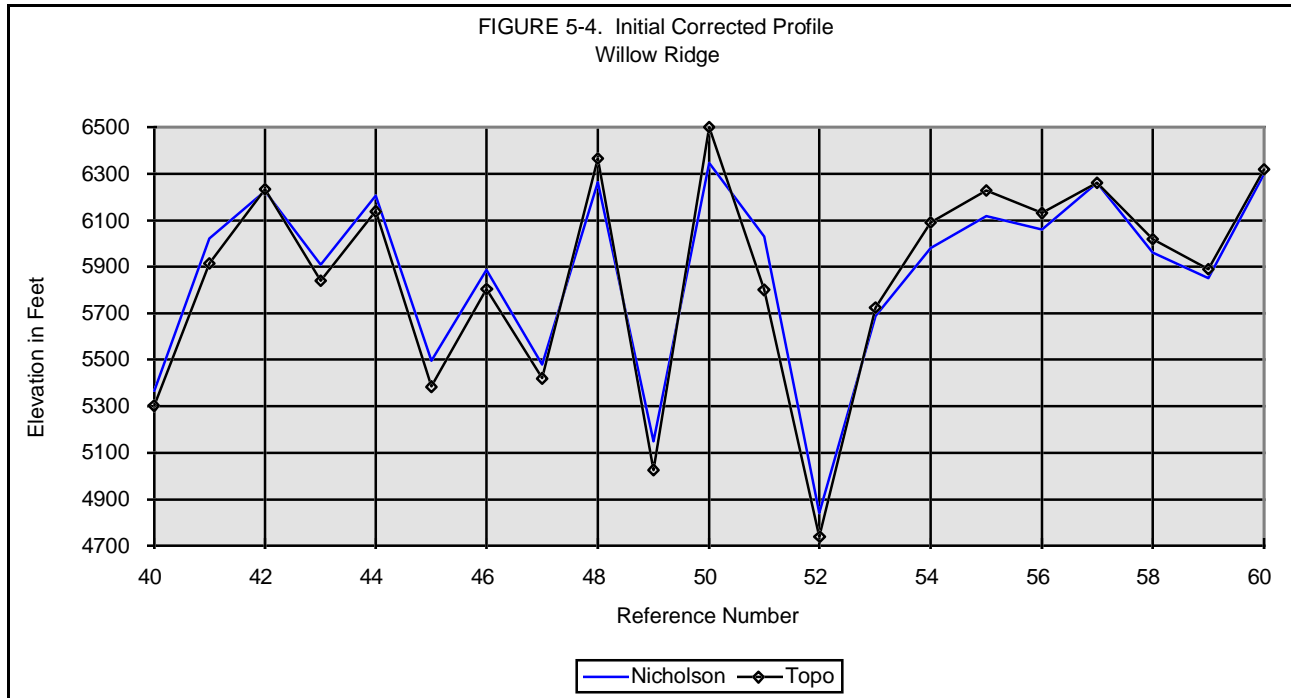


Figure 5-4 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Willow Ridge.

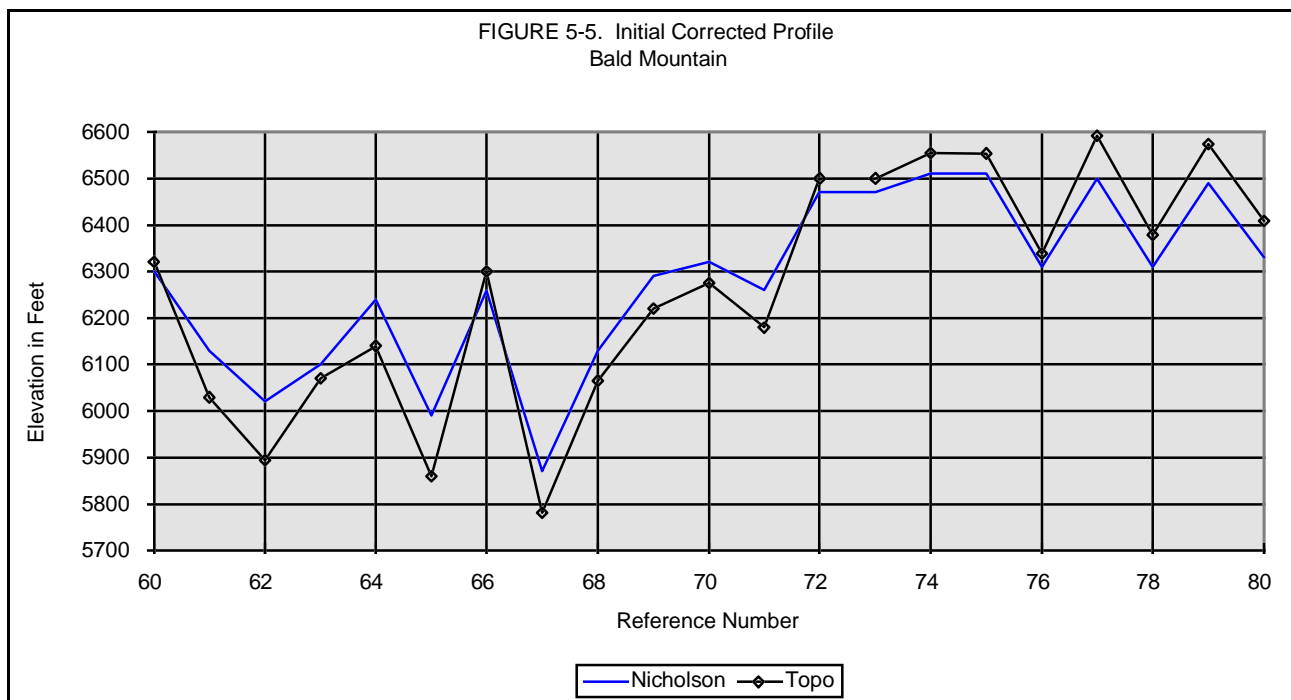


Figure 5-5 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Bald Mountain

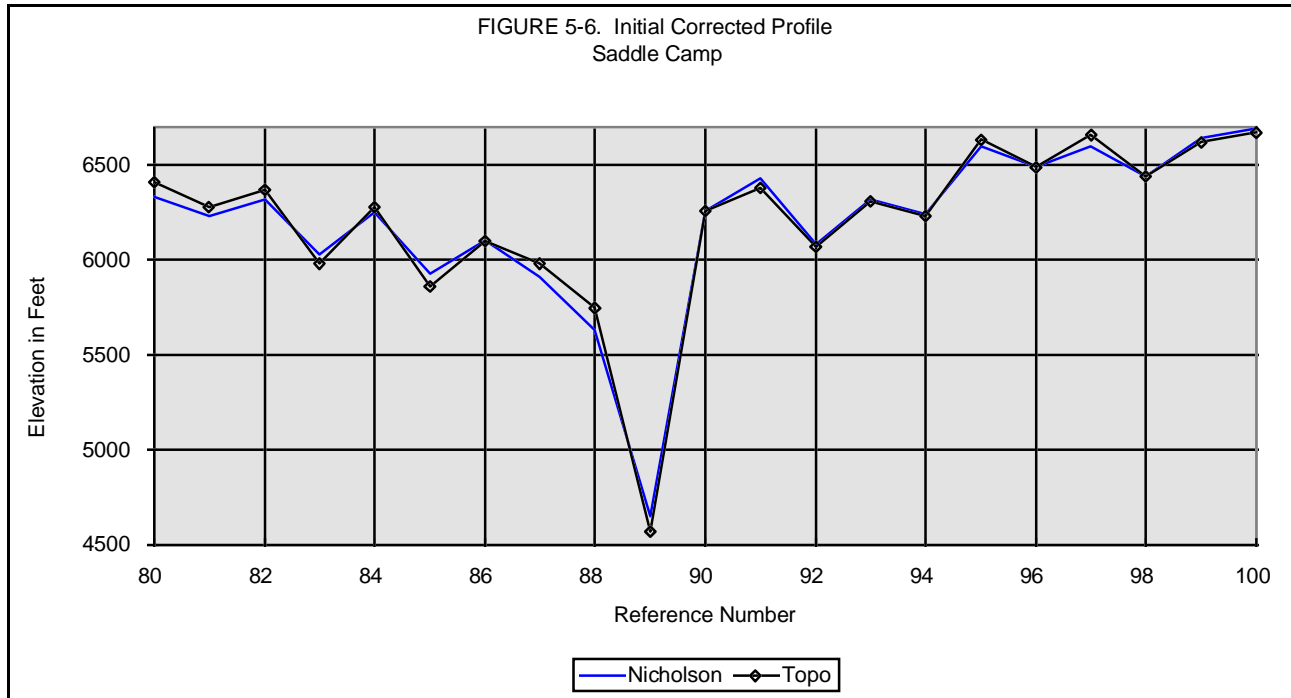


Figure 5-6 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Saddle Camp.

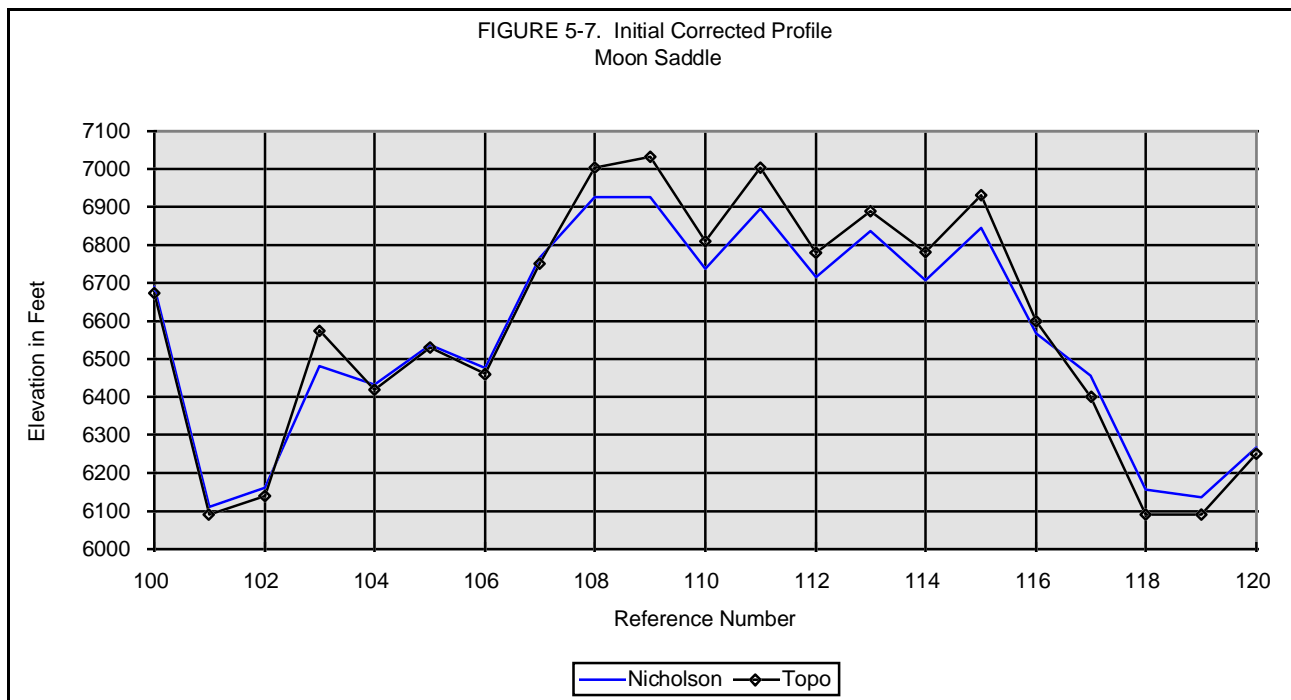


Figure 5-7 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Moon Saddle

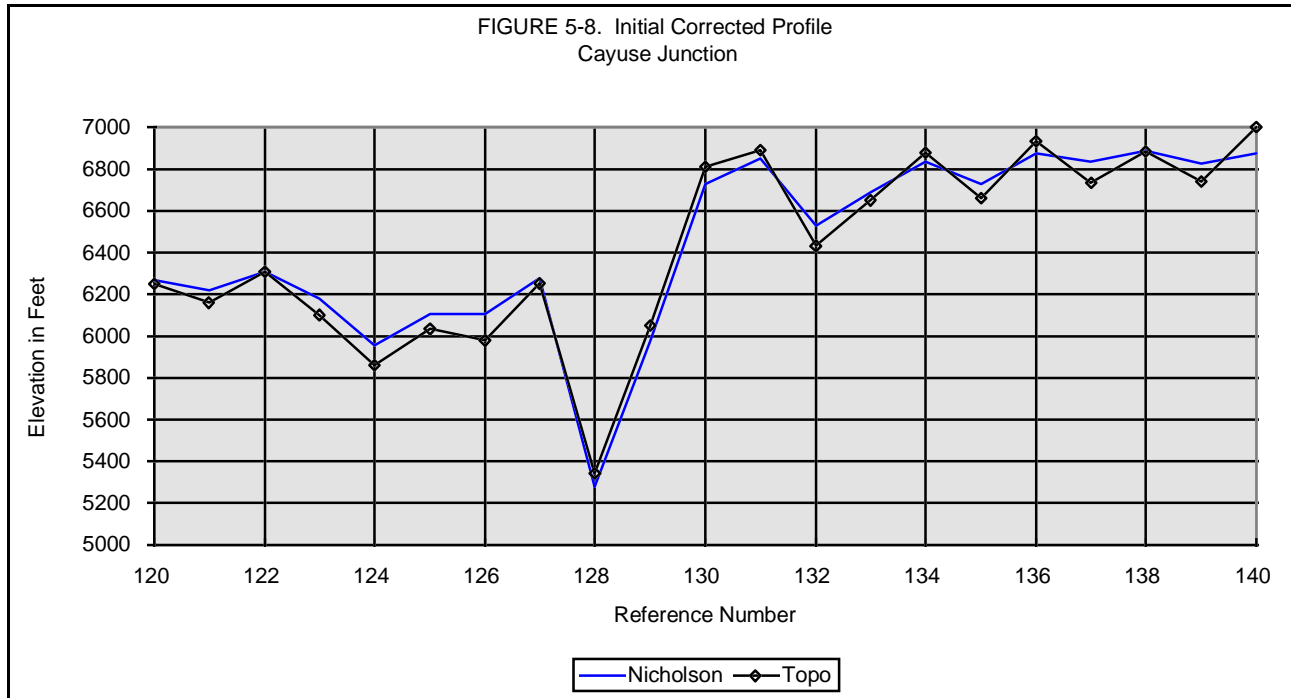


Figure 5-8 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Cayuse Junction.

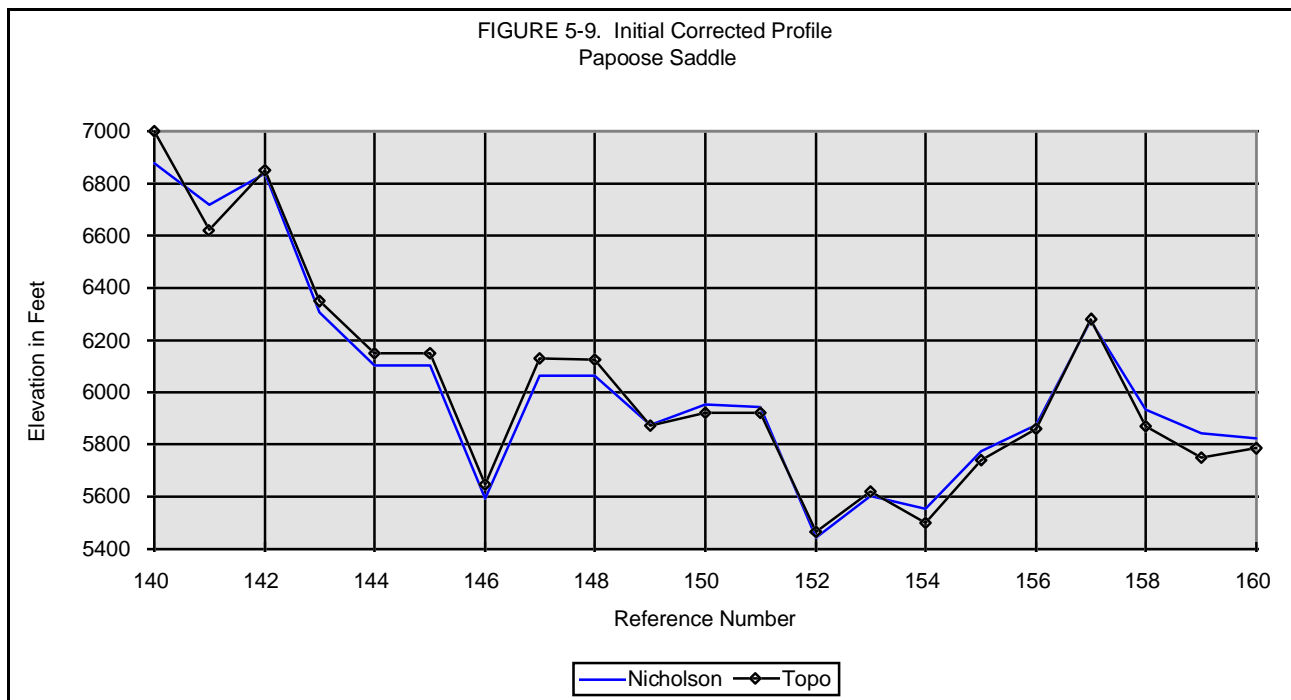


Figure 5-9 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Papoose Saddle

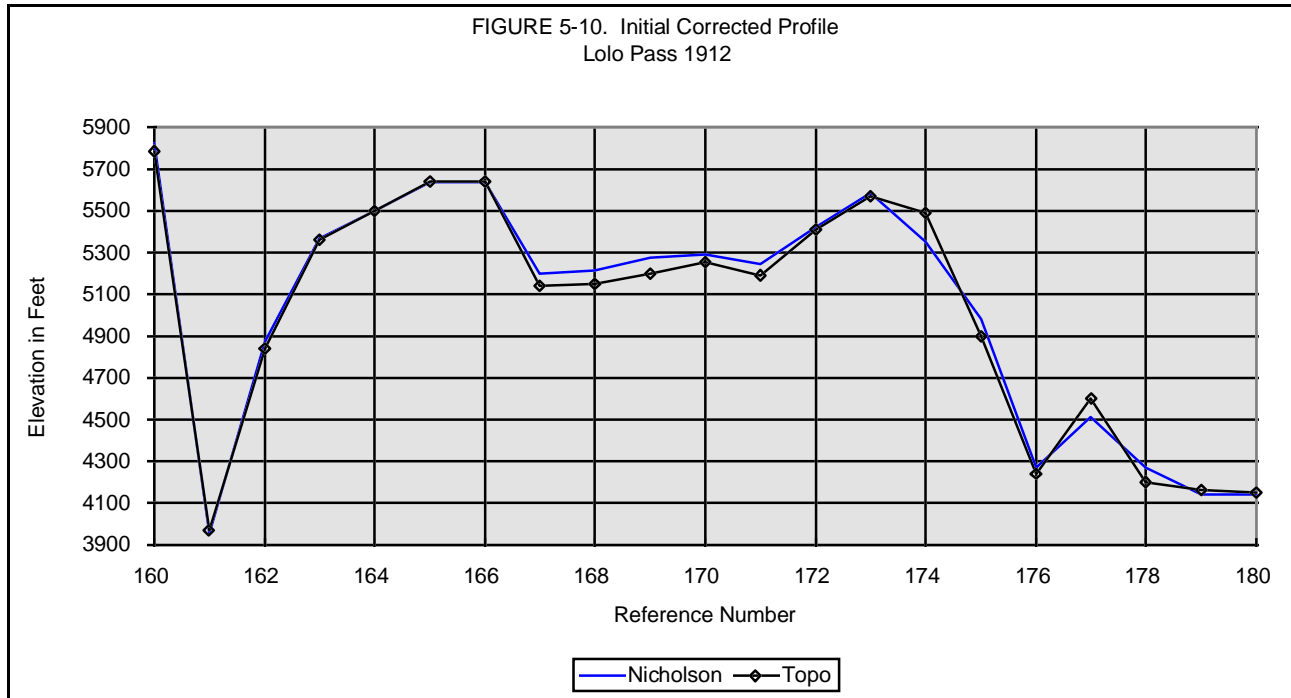


Figure 5-10 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Lolo Pass 1912.

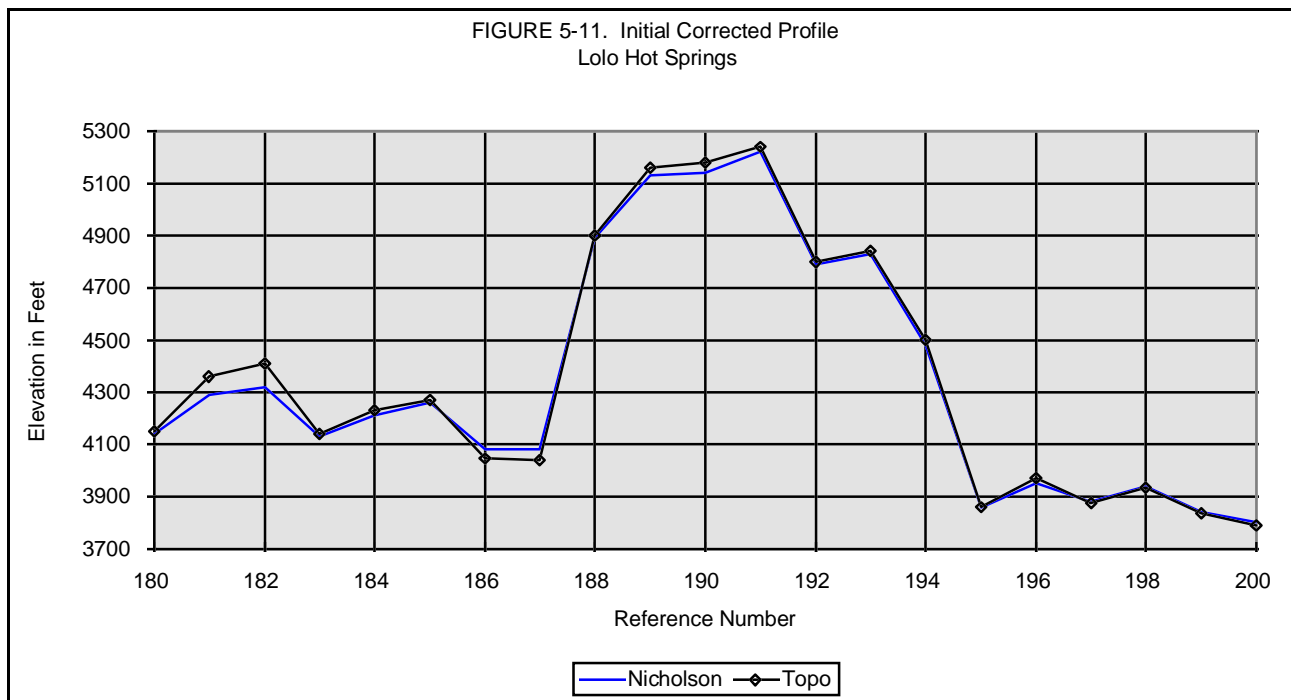


Figure 5-11 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Lolo Hot Springs.

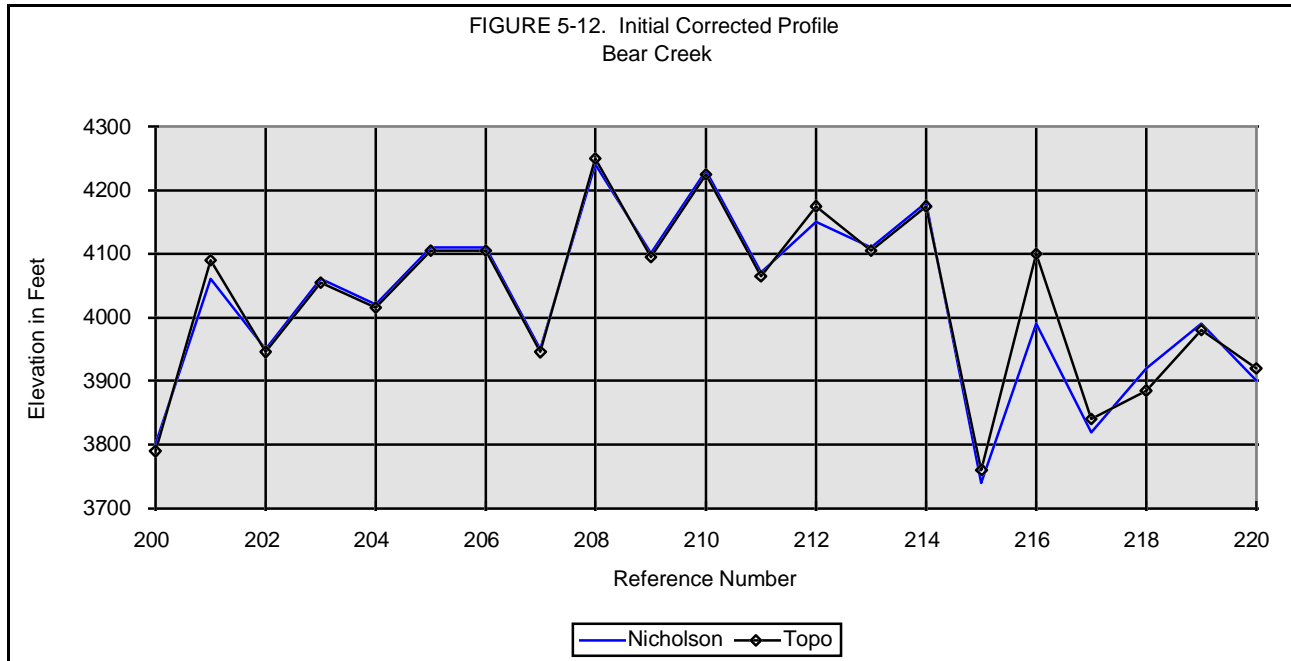


Figure 5-12 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Bear Creek.

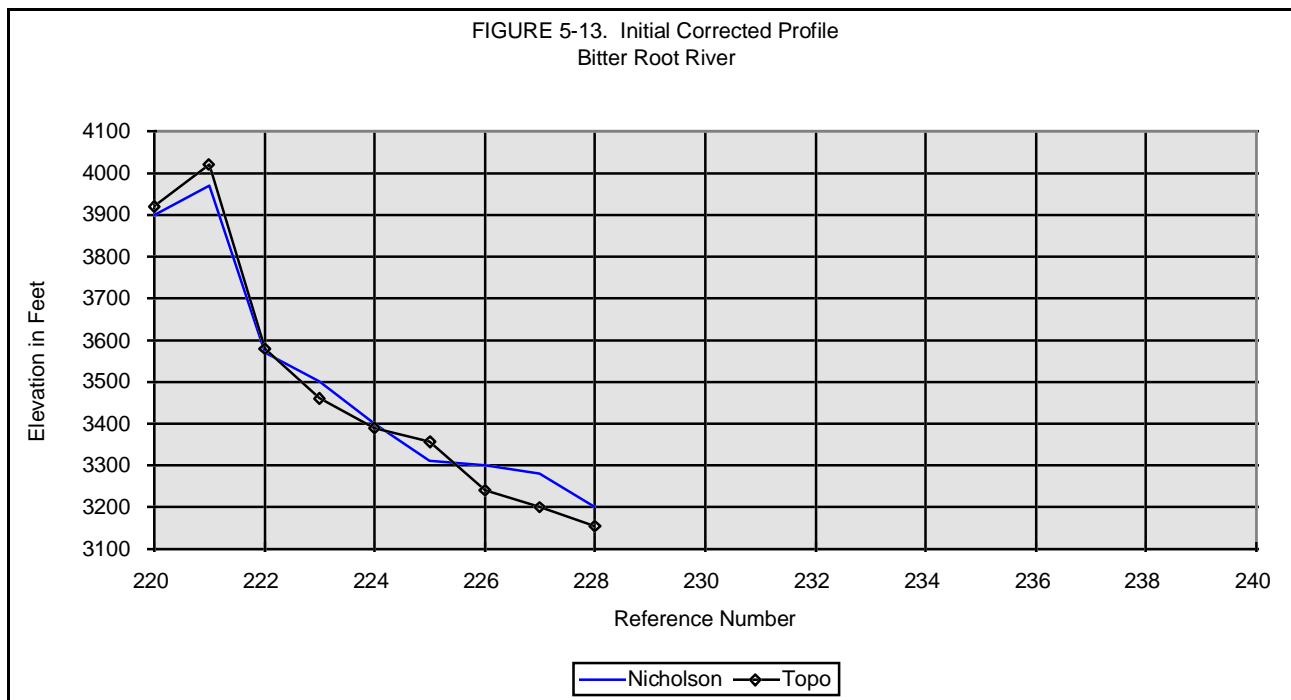


Figure 5-13 Initial average-value corrections to Nicholson data for step changes (average-valued changes) in elevation caused by barometric pressure changes - Bitter Root River.

To numerically evaluate the improvement in elevation estimation that has been obtained by correcting the average value errors due to barometric pressure changes, we compare the elevation differences before and after correction in Figures 5-14 and 5-15. The cumulative distribution functions before and after correction are shown in Figure 5-16. These figures clearly show the major improvement obtained by this simple correction method.

Figure 5-14. Elevation differences before correction. This plot shows the difference between Nicholson's initial barometric elevation (Column 5, **Table 2-1**) and the initial Topo elevation (Column 5, **Table 3-1**) before correction for step changes. The plot very clearly shows that the barometric elevation measurements have predictable linear error trends due to barometric (weather) changes.

Figure 5-15. Elevation differences after correction. After correction, the magnitudes of the elevation differences are considerably reduced as can readily be seen on this plot (Column 8, **Table 5-2**) with the same vertical scale as the plot of differences before correction.

Figure 5-16. Cumulative distribution of differences. This considerable improvement can also be illustrated by use of the cumulative distribution function shown for the differences both before and after correction. The curve on the right (uncorrected) shows that it requires an elevation error of over 300 feet to encompass 90% of the error values while the curve on the left (corrected) requires only a little over 100 feet. The applied correction for step changes thus reduces the statistical error to one-third of its original value.

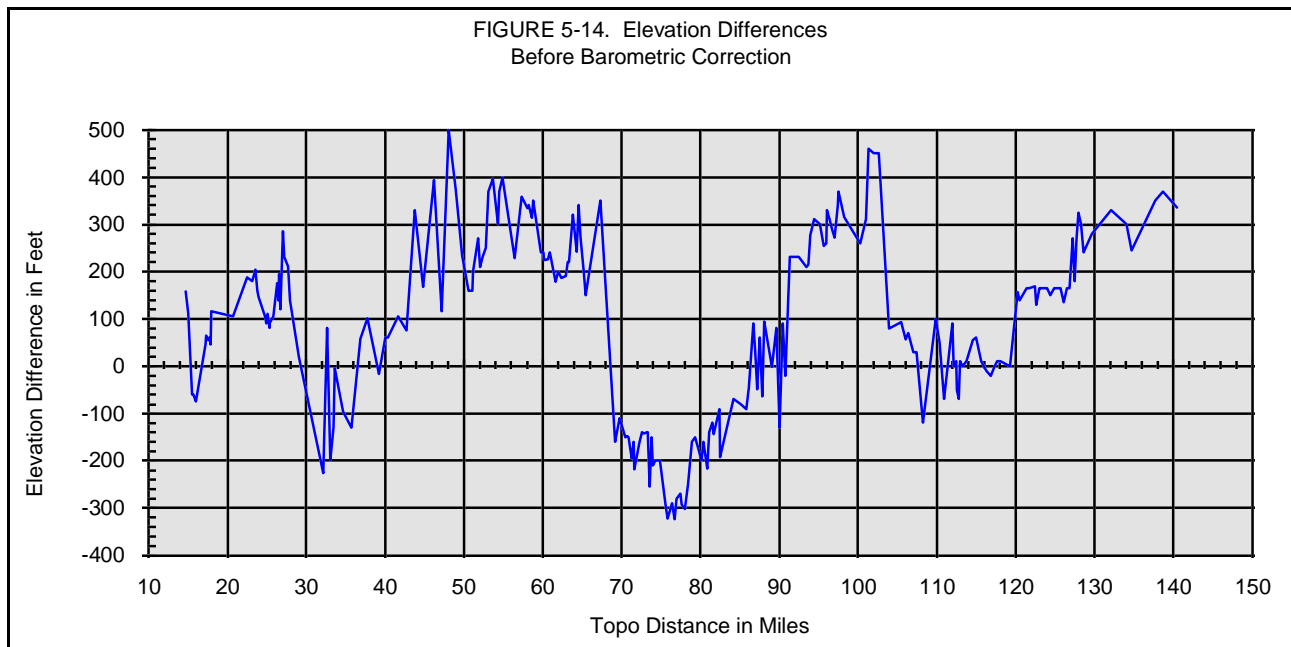


Figure 5-14 Elevation differences before initial correction for step changes due to barometric pressure variations with weather.

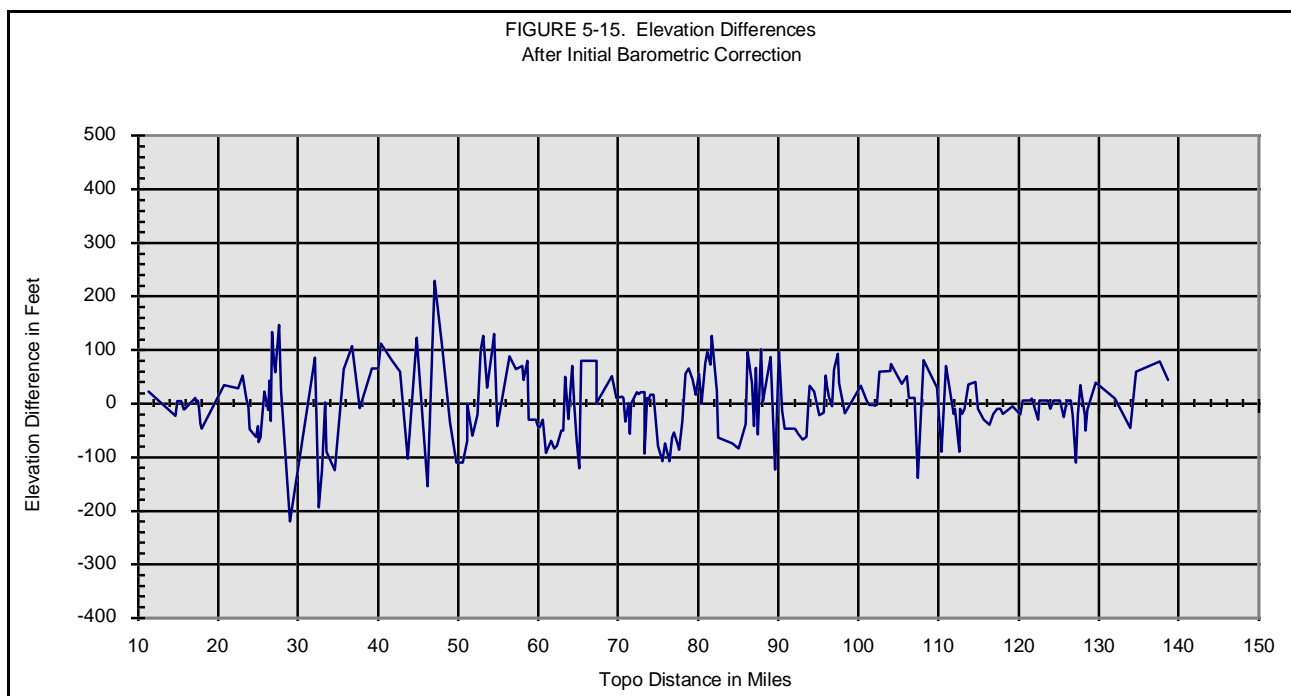


Figure 5-15 Elevation differences after initial correction for barometric changes.

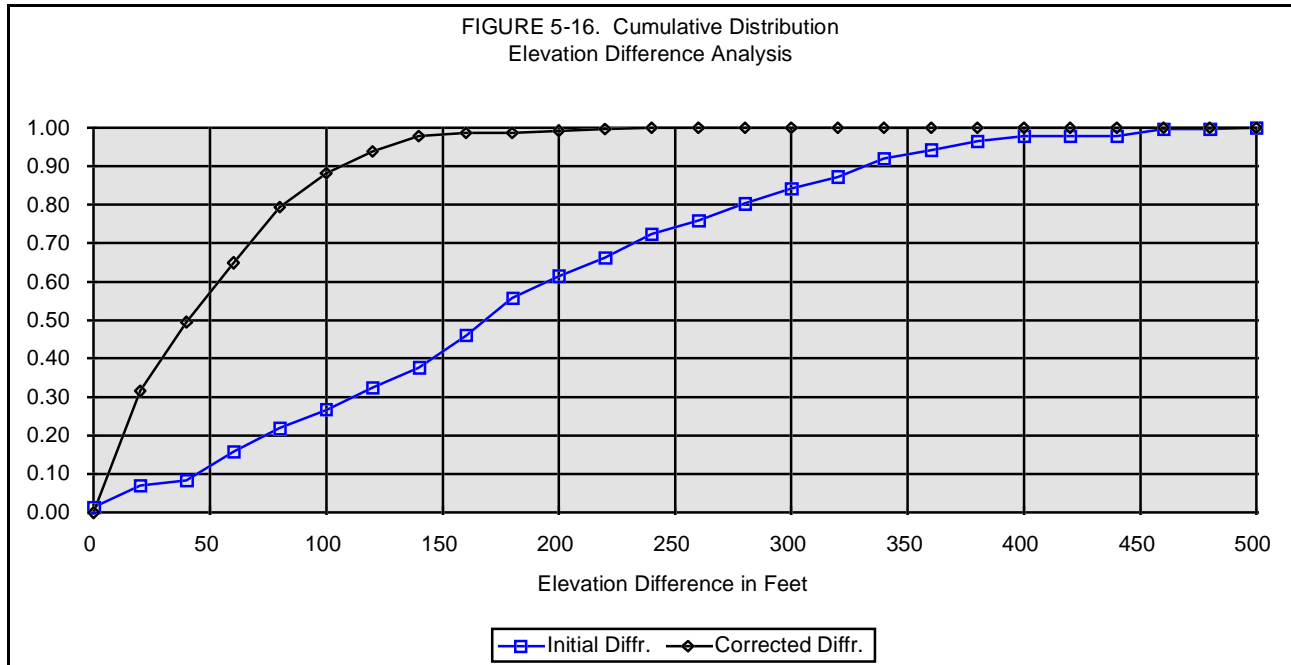


Figure 5-16 Cumulative distribution functions for elevation differences after and before initial barometric correction.

5.2 Analysis of Distance Data

Analysis of distance data was begun by noting that the distances reported by Nicholson were usually larger than the corresponding Topo distances. It was also noted that the Nicholson distances appeared to have several gross errors. The large error at reference point 33 in Column 3 of **Table 5-3** confirms an accuracy comment made by Nicholson on his profile map for this region.

From the initial distance differences, the potential gross error points and their difference values were identified as shown in **Table 5-3** below. The most significant error was almost seven miles at Reference #33. These error points are also shown in Column 3 of **Table 5-4**.

Table 5-3. Potential gross error points and associated difference values.			
Ref. No.	Difference	Ref. No.	Difference
11	0.05	46	0.80
13	0.95	52	0.85
23	0.60	70	0.80
31	0.80	161	0.90
@33	6.95	@167	1.00
36	0.90	179	0.60
42	0.60	184	0.80
@45	1.65	221	0.60

Table 5-4 To begin, the three reference points marked with the @ sign were manually edited. These three change differences were all reduced to values consistent with the errors in neighboring reference points.

Column 2 of **Table 5-4** is the difference between the original Nicholson distances (Column 3 of **Table 2-1**) and the initial Topo distances (Column 3 of **Table 3-1**) before any curve fitting or modification was performed. Reference point #40 (Beaver Dam Saddle, 36.85 miles) is used as the origin of the distance measurements for both data sets. **Figure 5-17** shows the distance correlation between the initial Nicholson data and the initial Topo data. Shortly after the cross-over point at 36.85 miles (Beaver Dam Saddle), the Nicholson curve approximates a straight line.

Column 3 represents the change between data points in Column 2, i.e., a measure of agreement between the data sets for the distances between adjacent points. If this change was larger than 0.5 miles, the reference point is marked with a # sign. The three large gross errors are marked with a @ sign. As an example, consider reference points #38 and #39. The Nicholson distance change from Column 3 of **Table 2-1** is 1.60 miles. The Topo distance change from Column 3 of **Table 3-1** is 1.10 miles. Reference point #39 in Column 3 of **Table 5-4** shows the correct change difference of 0.5 miles (Nicholson minus Topo). This value is also obtained by subtracting the value of #38 from #39 in Column 3. **Figure 5-18** is a plot of these change differences. Note the large difference, almost 7 miles, between points #32 and #33 at an initial Topo distance (x-axis) of about 30 miles. This reflects the gross error that Nicholson referred to on his profile map. A plot of change differences makes a good visual "detector" of these disagreements.

Column 4 is the initial Nicholson data with the three gross errors manually edited. These corrections are: #33=-6.45, #45=-1.25, and #167=-0.8. The remaining 13 potential gross error points were not edited. **Figure 5-19** shows the gross-error-corrected Nicholson distances of Column 4 and the initial Topo distances (y-axis) plotted against the initial Topo distances (x-axis). This plot shows that most of these modified Nicholson distances closely follow a straight line, when compared to the Topo distances, but at a different slope. This observation led to the conclusion that the Nicholson distance data could be corrected using straight-line approximations. This also makes sense when we know that the distance was measured by the travel time of a horse.

Column 5 shows the distance differences after gross error correction, i.e., the gross corrected Nicholson distances (Column 4) minus the initial Topo distances (Column 3 of **Table 3-1**). **Figure 5-20** is a plot of these distance differences as a function of the initial Topo distances. This plot is included to show, even more clearly than **Figure 5-19**, that the differences follow a strong linear trend which implies a fixed-rate error between Topo distances and distances measured with a horse.

Column 6 shows the Nicholson distances after they have been modified; first by editing the three gross errors and then by a single-line, linear regression curve fit to the gross-corrected distance differences in Column 5. The single-straight-line model used to modify the gross-corrected Nicholson distances is:

$$\begin{aligned}\text{New Value} &= (m)(\text{Old Value}) + b \\ \text{Slope, } m &= 0.8290 \\ \text{Intercept, } b &= 12.32 \\ \text{Error Sum, } e &= -0.30\end{aligned}$$

The correlation improvement obtained by applying this single straight-line correction is illustrated by **Figure 5-21**. Notice that the plot of the modified Nicholson data now lies nearly on top of the initial Topo data indicating that a straight-line fit made an excellent correction to the initial Nicholson distances.

Column 7 shows the difference between the straight-line-corrected Nicholson distances (Column 6) and the initial Topo distances (Column 3 of **Table 3-1**). **Figure 5-22** is a plot of the distance differences after the single straight-line correction. Comparing this figure with (**5-20**) illustrates a considerable decrease in the distance differences which corresponds to a much better agreement.

Column 8 shows the change in the differences of Column 7. Errors exceeding 0.5 miles have been marked with a > symbol.

From the results obtained in Column 7 of **Table 5-4**, we see that further straight-line approximations are needed to further correct the Nicholson distances for minor systematic errors. The summary of this further analysis, for seven line segments, is given in **Table 5-5**.

Table 5-5 To begin, Column 2 repeats the initial Topo distances given in Column 3 of **Table 3-1**. This was done for purposes of easy comparison.

Column 3 is the multiple-slope-corrected Nicholson data. A total of 7 additional straight-line corrections were made to the modified Nicholson distances given in Column 6 of **Table 5-4**. The correlation improvement obtained by multiple-slope correction is shown in **Figure 5-23**. The reference points corresponding to the start of each of the 7 straight-line segments are #1, #19, #31, #71, #168, #178, #222 and are marked with a > symbol. The straight-line correction parameters are shown in the header of **Table 5-5**. It may be helpful to summarize all the modifications to the initial Nicholson data that have occurred to this point:

1. Three gross errors were manually edited to reduce their influence on the straight-line corrections.
2. A single straight-line correction was applied to all the gross-error-corrected Nicholson distance data.

3. An additional 7 straight-line approximations were applied to the modified Nicholson distances.

Column 4 is the difference between points in Column 3, the multiple-slope-corrected Nicholson distances and Column 2, the initial Topo Distances. **Figure 5-24**, a plot of these differences, shows considerable decrease in the disagreement between the Topo distances and the modified Nicholson distances. The lack of perceptable linear trends in the differences also shows that the linear trends have been adequately modelled.

Column 5 is the change between adjacent points in the initial Topo distances of Column 2. These changes are computed for comparison with the corresponding changes in the multiple-slope corrected Nicholson distances.

Column 6 is the change between adjacent points in Column 3, the multiple-slope corrected Nicholson distances. These change values provide a very fine-scale measure of distances between adjacent points.

Column 7 is Column 6 minus Column 5, i.e., the difference between point-to-point distances in the Initial Topo estimate and corresponding point-to-point distances in the multiple-slope corrected Nicholson data. Differences marked with the > symbol are greater than 0.3 miles. These were marked to show where the greatest disagreements occur. **Figure 5-25** is a plot of these change differences (disagreements). The significant disagreements, such as -1.03 miles at a Topo distance of 109.85 miles, can only be resolved by detailed study of topographic features or by field research using the extant trail tread. Comparison with **(5-18)** shows the improvement that has been obtained by regression analysis of the linear trends.

Column 8 is the change in adjacent points of Column 7 where the symbol > marks distances greater than 0.5 miles. This "change of differences" is another very sensitive way to detect disagreements between Topo distances and Nicholson distance. **Figure 5-26** is a plot of these differences.

Figure 5-27 shows the cumulative distribution functions for both the single-straight-line-corrected and multiple-slope-corrected Nicholson data. The 90-th percentile has been decreased from about 2.3 miles to 0.6 miles, a considerable improvement.

Table 5-4: Distance Error Analysis - Part I - Single straight-line correction.

= Potential Gross Error @ = Corrected Gross Error

Straight-Line Correction Parameters: Slope: 0.8290
Intercept: 12.32
Sum Error: -0.30

Dir: e:\user\steve\trails\lolotral\research\birdtrue\nicholsn
File: profile2.wk1 (Lotus)

Ref Num.	Initial Distance Diff.	Initial Change Diff.	Gross Corrected Nicholson Distance	Gross Corrected Distance Diff.	Straight Line Corrected Nicholson Distance	Straight Line Corrected Distance Diff.
1	2	3	4	5		7
0						
1	-14.70		0.00	-14.70	12.32	-2.38
2	-14.30	0.40	0.70	-14.30	12.90	-2.10
3	-14.40	-0.10	1.05	-14.40	13.19	-2.26
4	-14.25	0.15	1.50	-14.25	13.56	-2.19
5	-14.20	0.05	1.80	-14.20	13.81	-2.19
6	-14.50	-0.30	2.70	-14.50	14.56	-2.64
7	-14.30	0.20	3.05	-14.30	14.85	-2.50
8	-14.15	0.15	3.40	-14.15	15.14	-2.41
9	-13.95	0.20	3.75	-13.95	15.43	-2.27
10	-13.85	0.10	4.00	-13.85	15.64	-2.21
11	-13.35	# 0.50	4.60	-13.35	16.13	-1.82
12	-13.50	-0.15	7.25	-13.50	18.33	-2.42
13	-12.55	# 0.95	10.00	-12.55	20.61	-1.94
14	-12.55	0.00	10.60	-12.55	21.11	-2.04
15	-12.60	-0.05	11.00	-12.60	21.44	-2.16
16	-12.65	-0.05	11.20	-12.65	21.60	-2.25
17	-12.70	-0.05	11.30	-12.70	21.69	-2.31

18	-12.65	0.05	12.15	-12.65	22.39	-2.41
19	-12.70	-0.05	12.30	-12.70	22.52	-2.48
20	-12.30	0.40	12.80	-12.30	22.93	-2.17
21	-11.95	0.35	13.40	-11.95	23.43	-1.92
22	-11.95	0.00	13.45	-11.95	23.47	-1.93
23	-11.35	# 0.60	14.50	-11.35	24.34	-1.51
24	-11.20	0.15	15.15	-11.20	24.88	-1.47
25	-10.90	0.30	15.60	-10.90	25.25	-1.25
26	-10.50	0.40	16.15	-10.50	25.71	-0.94
27	-10.35	0.15	16.40	-10.35	25.92	-0.83
28	-10.05	0.30	17.00	-10.05	26.41	-0.64
29	-9.95	0.10	17.25	-9.95	26.62	-0.58
30	-9.65	0.30	18.00	-9.65	27.24	-0.41
31	-8.85	# 0.80	19.10	-8.85	28.15	0.20
32	-9.10	-0.25	19.95	-9.10	28.86	-0.19
33	-2.15	@ 6.95	@23.55	-8.60	31.84	-0.31
34	-1.65	0.50	24.50	-8.10	32.63	0.03
35	-1.90	-0.25	24.65	-8.35	32.75	-0.25
36	-1.00	# 0.90	26.00	-7.45	33.87	0.42
37	-0.85	0.15	26.30	-7.30	34.12	0.52
38	-0.80	0.05	27.40	-7.25	35.03	0.38
39	-0.30	0.50	29.00	-6.75	36.36	0.61
40	0.00	0.30	30.40	-6.45	37.52	0.67
41	0.15	0.15	31.45	-6.30	38.39	0.64
42	0.75	# 0.60	33.55	-5.70	40.13	0.88
43	0.25	-0.50	33.85	-6.20	40.38	0.33
44	0.60	0.35	34.50	-5.85	40.92	0.57
45	2.25	@ 1.65	@36.25	-5.45	42.37	0.67
46	3.05	# 0.80	38.10	-4.65	43.90	1.15

47	3.25	0.20	39.30	-4.45	44.90	1.15
48	3.65	0.40	40.80	-4.05	46.14	1.29
49	4.10	0.45	42.60	-3.60	47.64	1.44
50	4.50	0.40	43.95	-3.20	48.75	1.60
51	4.40	-0.10	44.80	-3.30	49.46	1.36
52	5.25	# 0.85	46.50	-2.45	50.87	1.92
53	5.55	0.30	47.65	-2.15	51.82	2.02
54	5.60	0.05	48.50	-2.10	52.53	1.93
55	5.70	0.10	49.10	-2.00	53.02	1.92
56	5.70	0.00	49.20	-2.00	53.11	1.91
57	5.80	0.10	49.95	-1.90	53.73	1.88
58	6.00	0.20	50.40	-1.70	54.10	2.00
59	6.10	0.10	50.85	-1.60	54.47	2.02
60	6.15	0.05	51.30	-1.55	54.85	2.00
61	6.10	-0.05	51.55	-1.60	55.05	1.90
62	6.00	-0.10	51.95	-1.70	55.39	1.74
63	5.85	-0.15	52.50	-1.85	55.84	1.49
64	6.00	0.15	52.80	-1.70	56.09	1.59
65	6.00	0.00	53.25	-1.70	56.46	1.51
66	6.15	0.15	54.90	-1.55	57.83	1.38
67	6.50	0.35	56.10	-1.20	58.83	1.53
68	6.55	0.05	56.90	-1.15	59.49	1.44
69	7.05	0.50	57.55	-0.65	60.03	1.83
70	7.85	# 0.80	58.80	0.15	61.07	2.42
71	7.95	0.10	59.10	0.25	61.31	2.46
72	7.65	-0.30	59.70	-0.05	61.81	2.06
73	7.75	0.10	60.10	0.05	62.14	2.09
74	7.75	0.00	60.25	0.05	62.27	2.07
75	7.70	-0.05	60.60	0.00	62.56	1.96

76	7.50	-0.20	60.75	-0.20	62.68	1.73
77	7.75	0.25	61.70	0.05	63.47	1.82
78	7.70	-0.05	62.00	0.00	63.72	1.72
79	7.85	0.15	62.50	0.15	64.13	1.78
80	7.60	-0.25	62.80	-0.10	64.38	1.48
81	7.90	0.30	63.40	0.20	64.88	1.68
82	8.05	0.15	63.70	0.35	65.13	1.78
83	7.80	-0.25	63.90	0.10	65.29	1.49
84	8.10	0.30	64.70	0.40	65.96	1.66
85	8.35	0.25	65.20	0.65	66.37	1.82
86	8.40	0.05	65.50	0.70	66.62	1.82
87	8.55	0.15	66.00	0.85	67.03	1.88
88	8.50	-0.05	66.20	0.80	67.20	1.80
89	8.30	-0.20	67.90	0.60	68.61	1.31
89	8.30	0.00	67.90	0.60	68.61	1.31
90	7.95	-0.35	69.45	0.25	69.89	0.69
91	8.30	0.35	70.40	0.60	70.68	0.88
92	8.00	-0.30	70.80	0.30	71.01	0.51
93	8.40	0.40	71.40	0.70	71.51	0.81
94	8.60	0.20	71.80	0.90	71.84	0.94
95	8.75	0.15	72.35	1.05	72.30	1.00
96	8.80	0.05	72.60	1.10	72.51	1.01
97	9.10	0.30	73.05	1.40	72.88	1.23
98	8.90	-0.20	73.50	1.20	73.25	0.95
99	8.95	0.05	73.85	1.25	73.54	0.94
100	8.95	0.00	74.05	1.25	73.71	0.91
101	9.20	0.25	74.75	1.50	74.29	1.04
102	9.40	0.20	75.05	1.70	74.54	1.19
103	9.45	0.05	75.35	1.75	74.79	1.19

104	9.50	0.05	75.60	1.80	74.99	1.19
105	9.55	0.05	75.85	1.85	75.20	1.20
106	9.70	0.15	76.35	2.00	75.61	1.26
107	9.75	0.05	77.00	2.05	76.15	1.20
108	10.15	0.40	78.00	2.45	76.98	1.43
109	10.20	0.05	78.35	2.50	77.27	1.42
110	10.10	-0.10	78.80	2.40	77.65	1.25
111	10.30	0.20	79.30	2.60	78.06	1.36
112	10.25	-0.05	79.50	2.55	78.23	1.28
113	10.20	-0.05	79.95	2.50	78.60	1.15
114	10.45	0.25	80.35	2.75	78.93	1.33
115	10.40	-0.05	80.70	2.70	79.22	1.22
116	10.20	-0.20	80.90	2.50	79.39	0.99
117	10.50	0.30	81.65	2.80	80.01	1.16
118	10.60	0.10	82.20	2.90	80.46	1.16
119	10.70	0.10	82.70	3.00	80.88	1.18
120	10.55	-0.15	82.95	2.85	81.09	0.99
121	10.70	0.15	83.40	3.00	81.46	1.06
122	11.05	0.35	84.20	3.35	82.12	1.27
123	11.05	0.00	84.45	3.35	82.33	1.23
124	11.30	0.25	85.10	3.60	82.87	1.37
125	11.30	0.00	85.30	3.60	83.03	1.33
126	11.25	-0.05	85.90	3.55	83.53	1.18
127	11.55	0.30	86.35	3.85	83.90	1.40
128	11.35	-0.20	87.85	3.65	85.15	0.95
129	11.40	0.05	88.80	3.70	85.94	0.84
130	11.40	0.00	89.60	3.70	86.60	0.70
131	11.90	0.50	90.35	4.20	87.22	1.07
132	11.90	0.00	90.95	4.20	87.72	0.97

133	11.95	0.05	91.20	4.25	87.92	0.97
134	12.20	0.25	91.70	4.50	88.34	1.14
135	12.35	0.15	92.15	4.65	88.71	1.21
136	12.50	0.15	92.65	4.80	89.13	1.28
137	12.85	0.35	93.25	5.15	89.62	1.52
138	12.65	-0.20	94.05	4.95	90.29	1.19
139	12.65	0.00	94.55	4.95	90.70	1.10
140	12.55	-0.10	94.90	4.85	90.99	0.94
141	13.00	0.45	95.80	5.30	91.74	1.24
142	13.00	0.00	96.05	5.30	91.95	1.20
143	12.80	-0.20	96.45	5.10	92.28	0.93
144	12.90	0.10	97.30	5.20	92.98	0.88
145	12.95	0.05	97.75	5.25	93.35	0.85
146	12.85	-0.10	98.15	5.15	93.69	0.69
147	12.75	-0.10	98.50	5.05	93.98	0.53
148	12.75	0.00	98.80	5.05	94.23	0.48
149	12.75	0.00	99.00	5.05	94.39	0.44
150	12.65	-0.10	99.40	4.95	94.72	0.27
151	12.40	-0.25	99.80	4.70	95.05	-0.05
152	12.45	0.05	100.40	4.75	95.55	-0.10
153	12.50	0.05	100.75	4.80	95.84	-0.11
154	12.55	0.05	100.90	4.85	95.97	-0.08
155	12.60	0.05	101.25	4.90	96.26	-0.09
156	12.55	-0.05	101.55	4.85	96.50	-0.20
157	12.70	0.15	102.00	5.00	96.88	-0.12
158	12.55	-0.15	102.25	4.85	97.09	-0.31
159	12.60	0.05	102.45	4.90	97.25	-0.30
160	12.85	0.25	103.40	5.15	98.04	-0.21
161	13.75	# 0.90	106.30	6.05	100.44	0.19

162	14.00	0.25	107.30	6.30	101.27	0.27
163	14.05	0.05	107.70	6.35	101.60	0.25
164	14.05	0.00	108.35	6.35	102.14	0.14
165	14.00	-0.05	108.60	6.30	102.35	0.05
166	14.05	0.05	109.00	6.35	102.68	0.03
167	15.05	@ 1.00	110.50	6.55	103.92	-0.03
168	15.55	0.50	111.10	7.05	104.42	0.37
169	14.95	-0.60	111.90	6.45	105.09	-0.36
170	14.95	0.00	112.50	6.45	105.58	-0.47
171	14.90	-0.05	112.70	6.40	105.75	-0.55
172	14.50	-0.40	113.00	6.00	106.00	-1.00
173	14.70	0.20	113.60	6.20	106.49	-0.91
174	14.60	-0.10	114.30	6.10	107.07	-1.13
175	13.35	-1.25	114.70	4.85	107.41	-2.44
176	13.25	-0.10	115.10	4.75	107.74	-2.61
177	13.35	0.10	115.75	4.85	108.28	-2.62
178	12.80	-0.55	116.20	4.30	108.65	-3.25
179	13.40	# 0.60	117.00	4.90	109.31	-2.79
180	13.55	0.15	117.50	5.05	109.73	-2.72
181	13.65	0.10	117.70	5.15	109.89	-2.66
182	13.95	0.30	118.15	5.45	110.27	-2.43
183	14.15	0.20	118.55	5.65	110.60	-2.30
184	14.70	# 0.55	119.45	6.20	111.34	-1.91
185	14.95	0.25	120.20	6.45	111.97	-1.78
186	15.40	0.45	121.50	6.90	113.04	-1.56
187	15.35	-0.05	121.80	6.85	113.29	-1.66
188	15.30	-0.05	122.45	6.80	113.83	-1.82
189	15.50	0.20	123.30	7.00	114.54	-1.76
190	15.50	0.00	123.85	7.00	114.99	-1.86

191	15.40	-0.10	124.20	6.90	115.28	-2.02
192	15.55	0.15	124.75	7.05	115.74	-1.96
193	15.60	0.05	125.20	7.10	116.11	-1.99
194	15.60	0.00	126.35	7.10	117.06	-2.19
195	15.65	0.05	127.40	7.15	117.93	-2.32
196	16.05	0.40	128.00	7.55	118.43	-2.02
197	16.00	-0.05	128.85	7.50	119.14	-2.21
198	16.25	0.25	129.20	7.75	119.43	-2.02
199	16.65	0.40	129.85	8.15	119.97	-1.73
200	16.75	0.10	130.70	8.25	120.67	-1.78
201	17.00	0.25	131.10	8.50	121.00	-1.60
202	17.10	0.10	131.55	8.60	121.37	-1.58
203	17.10	0.00	131.75	8.60	121.54	-1.61
204	17.15	0.05	132.00	8.65	121.75	-1.60
205	17.25	0.10	132.20	8.75	121.91	-1.54
206	17.40	0.15	132.55	8.90	122.20	-1.45
207	17.70	0.30	133.15	9.20	122.70	-1.25
208	17.85	0.15	133.70	9.35	123.16	-1.19
209	18.00	0.15	134.35	9.50	123.70	-1.15
210	17.90	-0.10	134.55	9.40	123.86	-1.29
211	17.90	0.00	135.05	9.40	124.28	-1.37
212	18.15	0.25	135.70	9.65	124.82	-1.23
213	18.00	-0.15	136.00	9.50	125.06	-1.44
214	18.45	0.45	136.70	9.95	125.64	-1.11
215	18.45	0.00	137.10	9.95	125.98	-1.17
216	18.55	0.10	137.50	10.05	126.31	-1.14
217	19.00	0.45	138.20	10.50	126.89	-0.81
218	19.50	0.50	138.95	11.00	127.51	-0.44
219	19.35	-0.15	139.10	10.85	127.63	-0.62

220	19.70	0.35	139.60	11.20	128.05	-0.35
221	19.75	0.05	139.80	11.25	128.21	-0.34
222	20.35	# 0.60	141.50	11.85	129.62	-0.03
223	19.95	-0.40	143.50	11.45	131.28	-0.77
224	20.35	0.40	145.80	11.85	133.19	-0.76
225	20.35	0.00	146.50	11.85	133.77	-0.88
226	20.35	0.00	149.50	11.85	136.26	-1.39
227	20.35	0.00	150.50	11.85	137.08	-1.57
228	19.70	-0.65	151.65	11.20	138.04	-2.41

Table 5-5: Distance Error Analysis - Part II - Multiple straight-line correction.

> = Straight-Line Trend Change for Column 3

> = Error excess of 0.3 miles for Column 7

> = Error excess of 0.5 miles for Column 8

Dir: e:\user\steve\trails\lolotral\research\birdtrue\nicholsn

File: profile2.wk1 (Lotus)

Slope Correction Parameters

Ref. No.	Offset	Slope		Ref. No.	Offset	Slope
Bias (#40)	0.04			71-167	0.40	0.140
1-18	-0.10	0.190		168-177	-0.80	-0.550
19-30	0.40	0.550		178-221	-0.30	0.250
31-70	0.00	0.230		222-228	-0.90	-0.030

Ref. Num.	Initial Topo Distance	Multiple Slope Corrected Nicholson Distance	Multiple Slope Corrected Nicholson Distance	Initial Topo Change	Multiple Slope Corrected Change	Change Diff.	Change Change
1	2	3	4	5	6	7	8
1	14.70	14.64	-0.06				
2	15.00	15.21	0.21	0.30	0.57	0.27	
3	15.45	15.49	0.04	0.45	0.28	-0.17	-0.43

4	15.75	15.85	0.10	0.30	0.36	0.06	0.23
5	16.00	16.10	0.10	0.25	0.24	-0.01	-0.07
6	17.20	16.83	-0.38	1.20	0.73	> -0.47	-0.46
7	17.35	17.11	-0.24	0.15	0.28	0.13	> 0.60
8	17.55	17.39	-0.16	0.20	0.28	0.08	-0.05
9	17.70	17.68	-0.02	0.15	0.28	0.13	0.05
10	17.85	17.88	0.03	0.15	0.20	0.05	-0.08
11	17.95	18.36	0.41	0.10	0.49	> 0.39	0.33
12	20.75	20.51	-0.24	2.80	2.15	> -0.65	> -1.04
13	22.55	22.74	0.19	1.80	2.23	> 0.43	> 1.08
14	23.15	23.22	0.07	0.60	0.49	-0.11	> -0.54
15	23.60	23.55	-0.05	0.45	0.32	-0.13	-0.01
16	23.85	23.71	-0.14	0.25	0.16	-0.09	0.04
17	24.00	23.79	-0.21	0.15	0.08	-0.07	0.02
18	24.80	24.48	-0.32	0.80	0.69	-0.11	-0.04
19	25.00	> 24.95	-0.05	0.20	0.47	0.27	0.38
20	25.10	25.17	0.07	0.10	0.23	0.13	-0.14
21	25.35	25.44	0.09	0.25	0.27	0.02	-0.11
22	25.40	25.46	0.06	0.05	0.02	-0.03	-0.05
23	25.85	25.94	0.09	0.45	0.47	0.02	0.05
24	26.35	26.23	-0.12	0.50	0.29	-0.21	-0.23
25	26.50	26.43	-0.07	0.15	0.20	0.05	0.26
26	26.65	26.68	0.03	0.15	0.25	0.10	0.04
27	26.75	26.79	0.04	0.10	0.11	0.01	-0.09
28	27.05	27.06	0.01	0.30	0.27	-0.03	-0.04
29	27.20	27.17	-0.03	0.15	0.11	-0.04	-0.01
30	27.65	27.51	-0.14	0.45	0.34	-0.11	-0.08
31	27.95	> 28.36	0.41	0.30	0.85	> 0.55	> 0.66
32	29.05	29.01	-0.04	1.10	0.65	> -0.45	> -0.99

33	32.15	31.79	-0.36	3.10	2.77	> -0.33	0.12
34	32.60	32.52	-0.08	0.45	0.73	0.28	> 0.61
35	33.00	32.63	-0.37	0.40	0.12	-0.28	> -0.57
36	33.45	33.67	0.22	0.45	1.04	> 0.59	> 0.87
37	33.60	33.90	0.30	0.15	0.23	0.08	> -0.51
38	34.65	34.75	0.10	1.05	0.85	-0.20	-0.28
39	35.75	35.98	0.23	1.10	1.23	0.13	0.33
40	36.85	37.06	0.21	1.10	1.08	-0.02	-0.15
41	37.75	37.87	0.12	0.90	0.81	-0.09	-0.07
42	39.25	39.49	0.24	1.50	1.62	0.12	0.21
43	40.05	39.72	-0.33	0.80	0.23	> -0.57	> -0.69
44	40.35	40.22	-0.13	0.30	0.50	0.20	> 0.77
45	41.70	41.56	-0.14	1.35	1.35	0.00	-0.20
46	42.75	42.99	0.24	1.05	1.42	> 0.37	0.38
47	43.75	43.91	0.16	1.00	0.92	-0.08	-0.45
48	44.85	45.07	0.22	1.10	1.16	0.05	0.13
49	46.20	46.45	0.25	1.35	1.39	0.04	-0.02
50	47.15	47.49	0.34	0.95	1.04	0.09	0.05
51	48.10	48.15	0.05	0.95	0.65	-0.30	-0.39
52	48.95	49.46	0.51	0.85	1.31	> 0.46	> 0.75
53	49.80	50.34	0.54	0.85	0.89	0.04	-0.42
54	50.60	51.00	0.40	0.80	0.65	-0.15	-0.18
55	51.10	51.46	0.36	0.50	0.46	-0.04	0.11
56	51.20	51.54	0.34	0.10	0.08	-0.02	0.02
57	51.85	52.11	0.26	0.65	0.58	-0.07	-0.05
58	52.10	52.46	0.36	0.25	0.35	0.10	0.17
59	52.45	52.81	0.36	0.35	0.35	0.00	-0.10
60	52.85	53.15	0.30	0.40	0.35	-0.05	-0.05
61	53.15	53.35	0.20	0.30	0.19	-0.11	-0.05

62	53.65	53.65	0.00	0.50	0.31	-0.19	-0.08
63	54.35	54.08	-0.27	0.70	0.42	-0.28	-0.08
64	54.50	54.31	-0.19	0.15	0.23	0.08	0.36
65	54.95	54.65	-0.30	0.45	0.35	-0.10	-0.18
66	56.45	55.92	-0.53	1.50	1.27	-0.23	-0.13
67	57.30	56.85	-0.45	0.85	0.92	0.07	0.30
68	58.05	57.46	-0.59	0.75	0.62	-0.13	-0.21
69	58.20	57.97	-0.23	0.15	0.50	> 0.35	0.48
70	58.65	58.93	0.28	0.45	0.96	> 0.51	0.16
71	58.85	> 59.59	0.74	0.20	0.66	> 0.46	-0.05
72	59.75	60.10	0.35	0.90	0.52	> -0.38	> -0.84
73	60.05	60.45	0.40	0.30	0.34	0.04	0.43
74	60.20	60.57	0.37	0.15	0.13	-0.02	-0.06
75	60.60	60.88	0.28	0.40	0.30	-0.10	-0.08
76	60.95	61.00	0.05	0.35	0.13	-0.22	-0.12
77	61.65	61.82	0.17	0.70	0.82	0.12	0.34
78	62.00	62.08	0.08	0.35	0.26	-0.09	-0.21
79	62.35	62.51	0.16	0.35	0.43	0.08	0.17
80	62.90	62.77	-0.13	0.55	0.26	-0.29	-0.37
81	63.20	63.28	0.08	0.30	0.52	0.22	> 0.51
82	63.35	63.54	0.19	0.15	0.26	0.11	-0.11
83	63.80	63.71	-0.09	0.45	0.17	-0.28	-0.39
84	64.30	64.40	0.10	0.50	0.69	0.19	0.47
85	64.55	64.83	0.28	0.25	0.43	0.18	-0.01
86	64.80	65.09	0.29	0.25	0.26	0.01	-0.17
87	65.15	65.52	0.37	0.35	0.43	0.08	0.07
88	65.40	65.69	0.29	0.25	0.17	-0.08	-0.16
89	67.30	67.15	-0.15	1.90	1.46	> -0.44	-0.36
89	67.30	67.15	-0.15	0.00	0.00	0.00	0.44

90	69.20	68.49	-0.71	1.90	1.33	> -0.57	> -0.57
91	69.80	69.30	-0.50	0.60	0.82	0.22	> 0.78
92	70.50	69.65	-0.85	0.70	0.34	> -0.36	> -0.57
93	70.70	70.16	-0.54	0.20	0.52	> 0.32	> 0.67
94	70.90	70.51	-0.39	0.20	0.34	0.14	-0.17
95	71.30	70.98	-0.32	0.40	0.47	0.07	-0.07
96	71.50	71.20	-0.30	0.20	0.22	0.02	-0.06
97	71.65	71.58	-0.07	0.15	0.39	0.24	0.22
98	72.30	71.97	-0.33	0.65	0.39	-0.26	-0.50
99	72.60	72.27	-0.33	0.30	0.30	0.00	0.26
100	72.80	72.44	-0.36	0.20	0.17	-0.03	-0.03
101	73.25	73.05	-0.20	0.45	0.60	0.15	0.18
102	73.35	73.30	-0.05	0.10	0.26	0.16	0.01
103	73.60	73.56	-0.04	0.25	0.26	0.01	-0.15
104	73.80	73.78	-0.02	0.20	0.22	0.02	0.01
105	74.00	73.99	-0.01	0.20	0.22	0.02	0.00
106	74.35	74.42	0.07	0.35	0.43	0.08	0.07
107	74.95	74.98	0.03	0.60	0.56	-0.04	-0.12
108	75.55	75.84	0.29	0.60	0.86	0.26	0.30
109	75.85	76.14	0.29	0.30	0.30	0.00	-0.26
110	76.40	76.53	0.13	0.55	0.39	-0.16	-0.16
111	76.70	76.96	0.26	0.30	0.43	0.13	0.29
112	76.95	77.13	0.18	0.25	0.17	-0.08	-0.21
113	77.45	77.52	0.07	0.50	0.39	-0.11	-0.03
114	77.60	77.86	0.26	0.15	0.34	0.19	0.31
115	78.00	78.16	0.16	0.40	0.30	-0.10	-0.29
116	78.40	78.33	-0.07	0.40	0.17	-0.23	-0.13
117	78.85	78.98	0.13	0.45	0.64	0.20	0.42
118	79.30	79.45	0.15	0.45	0.47	0.02	-0.17

119	79.70	79.88	0.18	0.40	0.43	0.03	0.01
120	80.10	80.10	0.00	0.40	0.22	-0.18	-0.21
121	80.40	80.48	0.08	0.30	0.39	0.09	0.27
122	80.85	81.17	0.32	0.45	0.69	0.24	0.15
123	81.10	81.39	0.29	0.25	0.22	-0.03	-0.27
124	81.50	81.95	0.45	0.40	0.56	0.16	0.19
125	81.70	82.12	0.42	0.20	0.17	-0.03	-0.19
126	82.35	82.63	0.28	0.65	0.52	-0.13	-0.11
127	82.50	83.02	0.52	0.15	0.39	0.24	0.37
128	84.20	84.31	0.11	1.70	1.29	> -0.41	> -0.65
129	85.10	85.13	0.03	0.90	0.82	-0.08	0.33
130	85.90	85.82	-0.08	0.80	0.69	-0.11	-0.03
131	86.15	86.46	0.31	0.25	0.64	> 0.39	> 0.51
132	86.75	86.98	0.23	0.60	0.52	-0.08	-0.48
133	86.95	87.19	0.24	0.20	0.22	0.02	0.10
134	87.20	87.62	0.42	0.25	0.43	0.18	0.17
135	87.50	88.01	0.51	0.30	0.39	0.09	-0.09
136	87.85	88.44	0.59	0.35	0.43	0.08	-0.01
137	88.10	88.96	0.86	0.25	0.52	0.27	0.19
138	89.10	89.64	0.54	1.00	0.69	> -0.31	> -0.58
139	89.60	90.07	0.47	0.50	0.43	-0.07	0.24
140	90.05	90.37	0.32	0.45	0.30	-0.15	-0.08
141	90.50	91.15	0.65	0.45	0.77	> 0.32	0.47
142	90.75	91.36	0.61	0.25	0.22	-0.03	-0.36
143	91.35	91.71	0.36	0.60	0.34	-0.26	-0.22
144	92.10	92.44	0.34	0.75	0.73	-0.02	0.24
145	92.50	92.83	0.33	0.40	0.39	-0.01	0.01
146	93.00	93.17	0.17	0.50	0.34	-0.16	-0.14
147	93.45	93.47	0.02	0.45	0.30	-0.15	0.01

148	93.75	93.73	-0.02	0.30	0.26	-0.04	0.11
149	93.95	93.90	-0.05	0.20	0.17	-0.03	0.01
150	94.45	94.24	-0.21	0.50	0.34	-0.16	-0.13
151	95.10	94.59	-0.51	0.65	0.34	> -0.31	-0.15
152	95.65	95.10	-0.55	0.55	0.52	-0.03	0.27
153	95.95	95.41	-0.54	0.30	0.30	0.00	0.04
154	96.05	95.53	-0.52	0.10	0.13	0.03	0.03
155	96.35	95.84	-0.51	0.30	0.30	0.00	-0.03
156	96.70	96.09	-0.61	0.35	0.26	-0.09	-0.09
157	97.00	96.48	-0.52	0.30	0.39	0.09	0.18
158	97.40	96.70	-0.70	0.40	0.22	-0.19	-0.27
159	97.55	96.87	-0.68	0.15	0.17	0.02	0.21
160	98.25	97.68	-0.57	0.70	0.82	0.12	0.09
161	100.25	100.18	-0.07	2.00	2.49	> 0.49	0.38
162	101.00	101.04	0.04	0.75	0.86	0.11	-0.38
163	101.35	101.38	0.03	0.35	0.34	-0.01	-0.12
164	102.00	101.94	-0.06	0.65	0.56	-0.09	-0.09
165	102.30	102.16	-0.14	0.30	0.22	-0.08	0.01
166	102.65	102.50	-0.15	0.35	0.34	-0.01	0.08
167	103.95	103.79	-0.16	1.30	1.29	-0.01	0.00
168	104.05	>103.92	-0.13	0.10	0.13	0.03	0.04
169	105.45	105.16	-0.29	1.40	1.24	-0.16	-0.19
170	106.05	106.09	0.04	0.60	0.93	> 0.33	0.49
171	106.30	106.40	0.10	0.25	0.31	0.06	-0.27
172	107.00	106.87	-0.13	0.70	0.46	-0.24	-0.30
173	107.40	107.80	0.40	0.40	0.93	> 0.53	> 0.77
174	108.20	108.88	0.68	0.80	1.09	0.29	-0.24
175	109.85	109.50	-0.35	1.65	0.62	> -1.03	> -1.31
176	110.35	110.12	-0.23	0.50	0.62	0.12	> 1.15

177	110.90	111.13	0.23	0.55	1.01	> 0.46	0.34
178	111.90	>111.17	-0.73	1.00	0.04	> -0.96	> -1.42
179	112.10	111.77	-0.33	0.20	0.60	> 0.40	> 1.36
180	112.45	112.14	-0.31	0.35	0.38	0.02	-0.38
181	112.55	112.29	-0.26	0.10	0.15	0.05	0.03
182	112.70	112.63	-0.07	0.15	0.34	0.19	0.14
183	112.90	112.93	0.03	0.20	0.30	0.10	-0.09
184	113.25	113.60	0.35	0.35	0.68	0.33	-0.23
185	113.75	114.17	0.42	0.50	0.56	> 0.39	0.06
186	114.60	115.14	0.54	0.85	0.98	0.13	-0.26
187	114.95	115.37	0.42	0.35	0.23	-0.13	-0.25
188	115.65	115.85	0.20	0.70	0.49	-0.21	-0.09
189	116.30	116.49	0.19	0.65	0.64	-0.01	0.20
190	116.85	116.90	0.05	0.55	0.41	-0.14	-0.13
191	117.30	117.17	-0.13	0.45	0.26	-0.19	-0.05
192	117.70	117.58	-0.12	0.40	0.41	0.01	0.20
193	118.10	117.92	-0.18	0.40	0.34	-0.06	-0.08
194	119.25	118.78	-0.47	1.15	0.86	-0.29	-0.22
195	120.25	119.57	-0.68	1.00	0.79	-0.21	0.08
196	120.45	120.02	-0.43	0.20	0.45	0.25	0.46
197	121.35	120.65	-0.70	0.90	0.64	-0.26	> -0.51
198	121.45	120.92	-0.53	0.10	0.26	0.16	0.42
199	121.70	121.40	-0.30	0.25	0.49	0.24	0.08
200	122.45	122.04	-0.41	0.75	0.64	-0.11	-0.35
201	122.60	122.34	-0.26	0.15	0.30	0.15	0.26
202	122.95	122.68	-0.27	0.35	0.34	-0.01	-0.16
203	123.15	122.83	-0.32	0.20	0.15	-0.05	-0.04
204	123.35	123.02	-0.33	0.20	0.19	-0.01	0.04
205	123.45	123.17	-0.28	0.10	0.15	0.05	0.06

206	123.65	123.43	-0.22	0.20	0.26	0.06	0.01
207	123.95	123.88	-0.07	0.30	0.45	0.15	0.09
208	124.35	124.29	-0.06	0.40	0.41	0.01	-0.14
209	124.85	124.78	-0.07	0.50	0.49	-0.01	-0.02
210	125.15	124.93	-0.22	0.30	0.15	-0.15	-0.14
211	125.65	125.30	-0.35	0.50	0.38	-0.13	0.02
212	126.05	125.79	-0.26	0.40	0.49	0.09	0.21
213	126.50	126.02	-0.48	0.45	0.23	-0.23	-0.31
214	126.75	126.54	-0.21	0.25	0.52	0.27	0.50
215	127.15	126.84	-0.31	0.40	0.30	-0.10	-0.37
216	127.45	127.14	-0.31	0.30	0.30	0.00	0.10
217	127.70	127.67	-0.03	0.25	0.52	0.27	0.27
218	127.95	128.23	0.28	0.25	0.56	> 0.31	0.04
219	128.25	128.34	0.09	0.30	0.11	-0.19	-0.50
220	128.40	128.72	0.32	0.15	0.38	0.22	0.41
221	128.55	128.87	0.32	0.15	0.15	0.00	-0.22
222	129.65	>129.72	0.07	1.10	0.85	-0.25	-0.25
223	132.05	131.78	-0.27	2.40	2.06	> -0.34	-0.09
224	133.95	134.15	0.20	1.90	2.37	> 0.47	> 0.81
225	134.65	134.87	0.22	0.70	0.72	0.02	-0.45
226	137.65	137.96	0.31	3.00	3.09	0.09	0.07
227	138.65	138.99	0.34	1.00	1.03	0.03	-0.06
228	140.45	140.17	-0.28	1.80	1.18	> -0.62	> -0.65

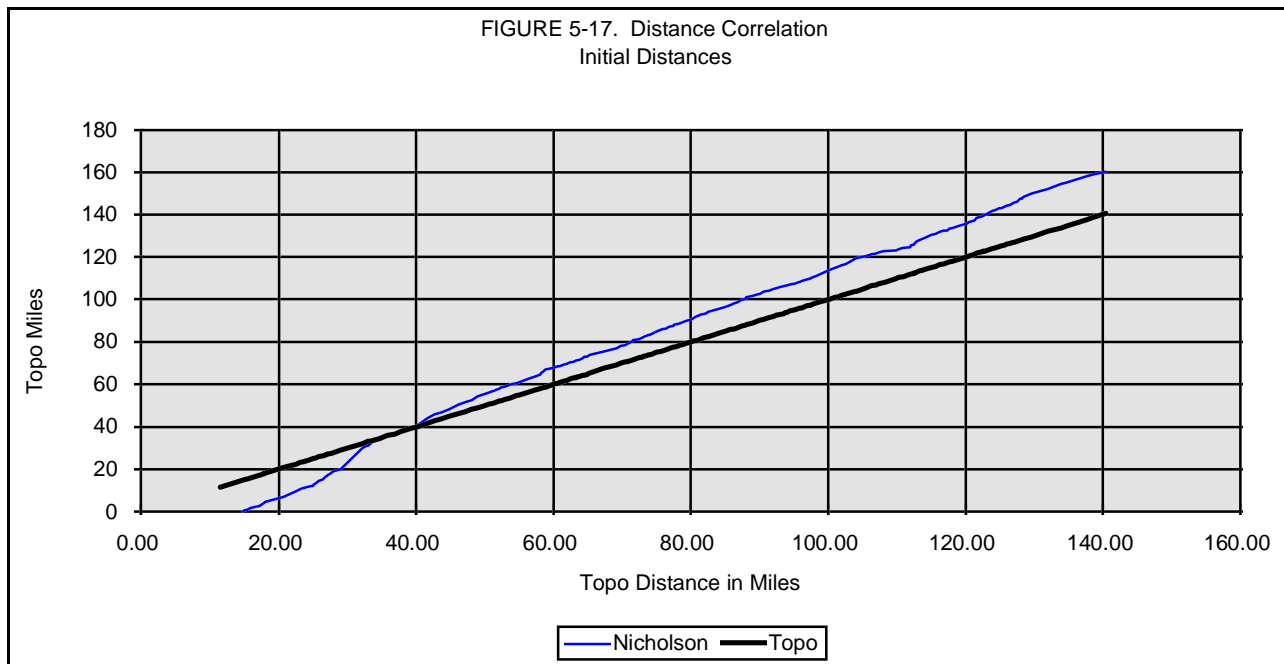


Figure 5-17 Distance correlation between the initial Nicholson distances and the initial Topo distances (Table 5-4, Col. 2).

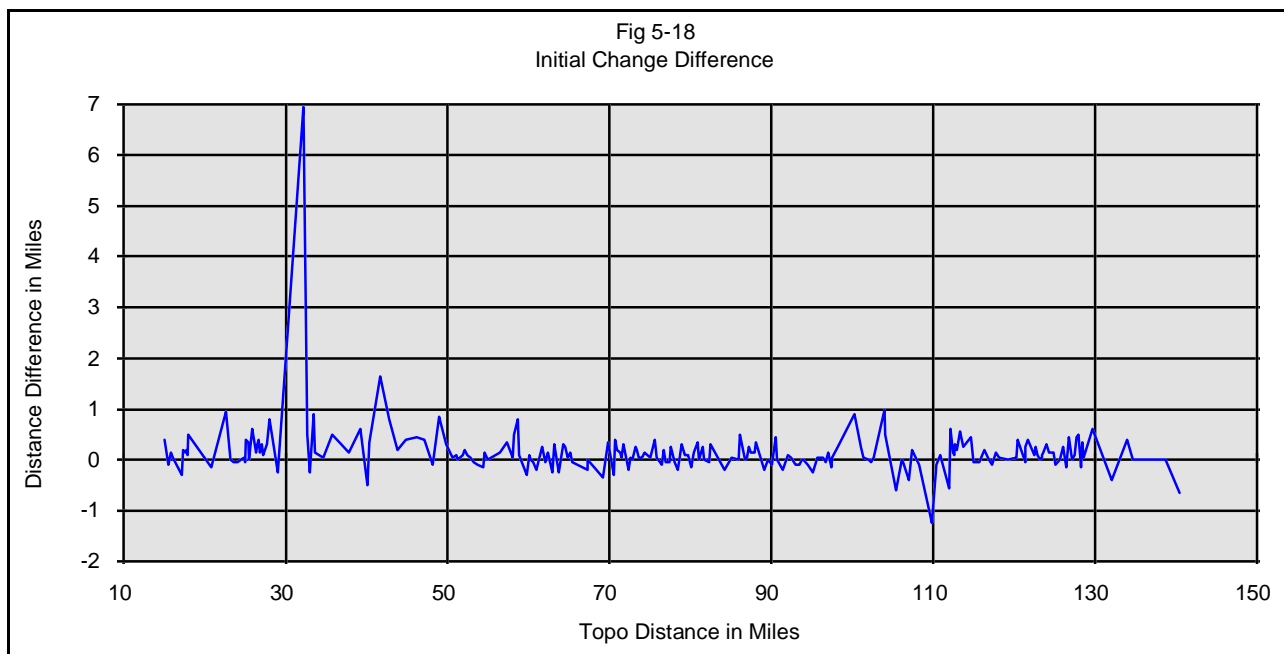


Figure 5-18 Plot of the differences of the changes in the initial Nicholson data and the initial Topo data - showing gross errors (Table 5-4, Col. 3).

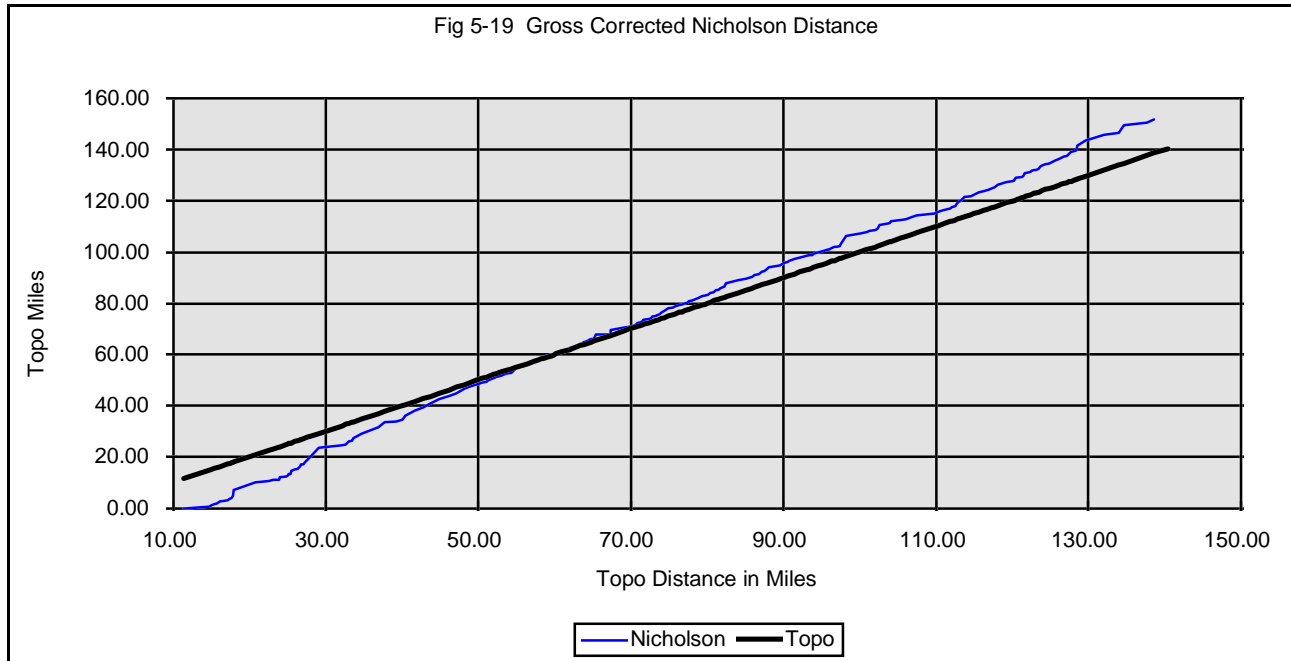


Figure 5-19 Correlation of the initial Topo distance with the Nicholson data after correction for gross errors at points #33, #45, and #167 (Table 5-4, Col. 4).

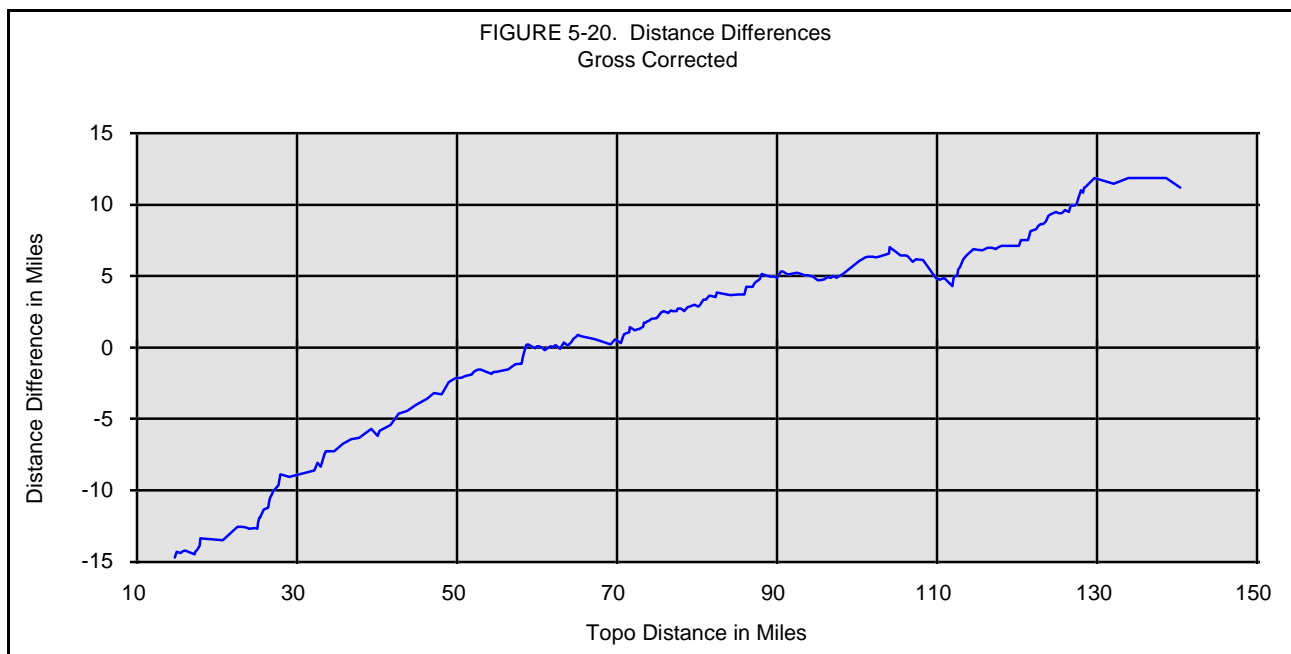


Figure 5-20 Plot of distance differences after gross correction of Nicholson data at points #33, #45, and #167 (Table 5-4, Col. 5).

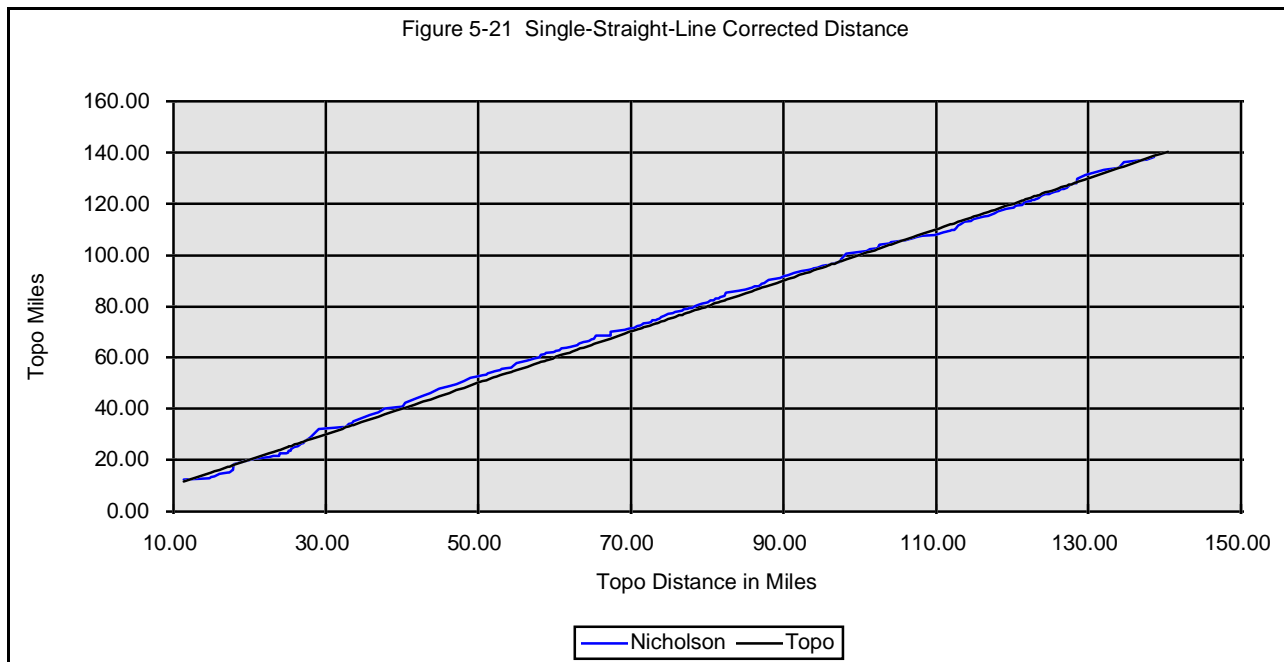


Figure 5-21 Distance correlation of Nicholson data after a single straight-line correction (Table 5-4, Col. 6).

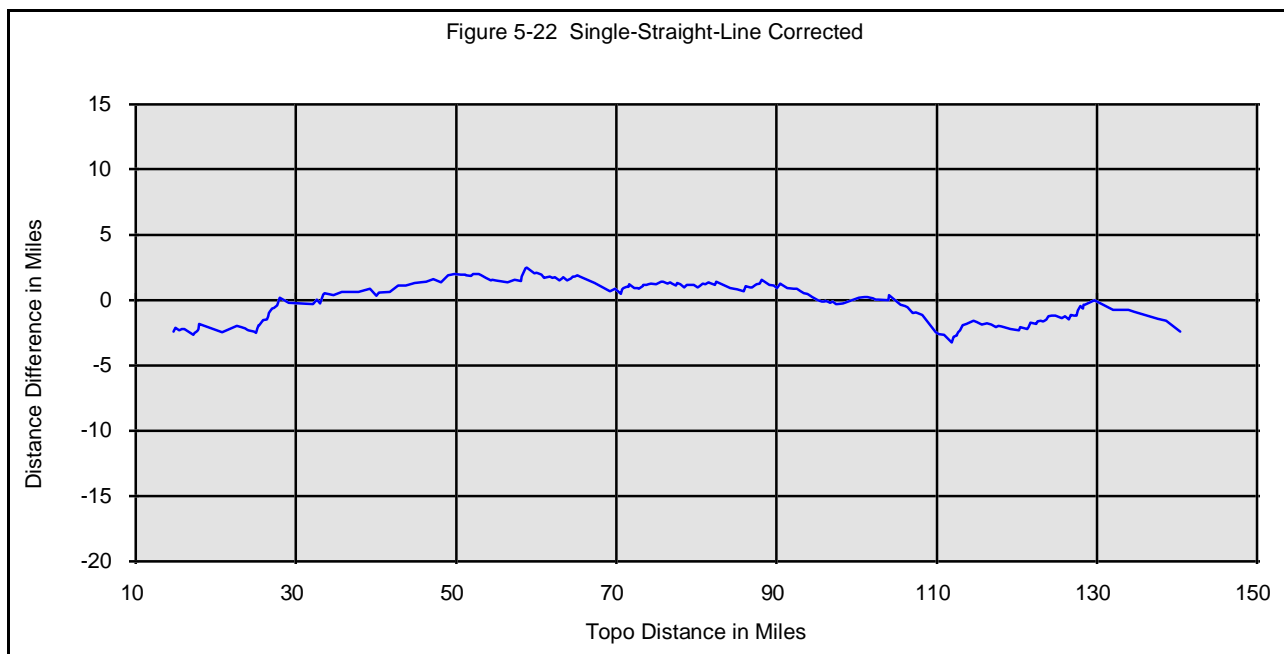


Figure 5-22 Correlation of initial Topo data with Nicholson data after single straight-line correction has been applied (Table 5-4, Col. 7).

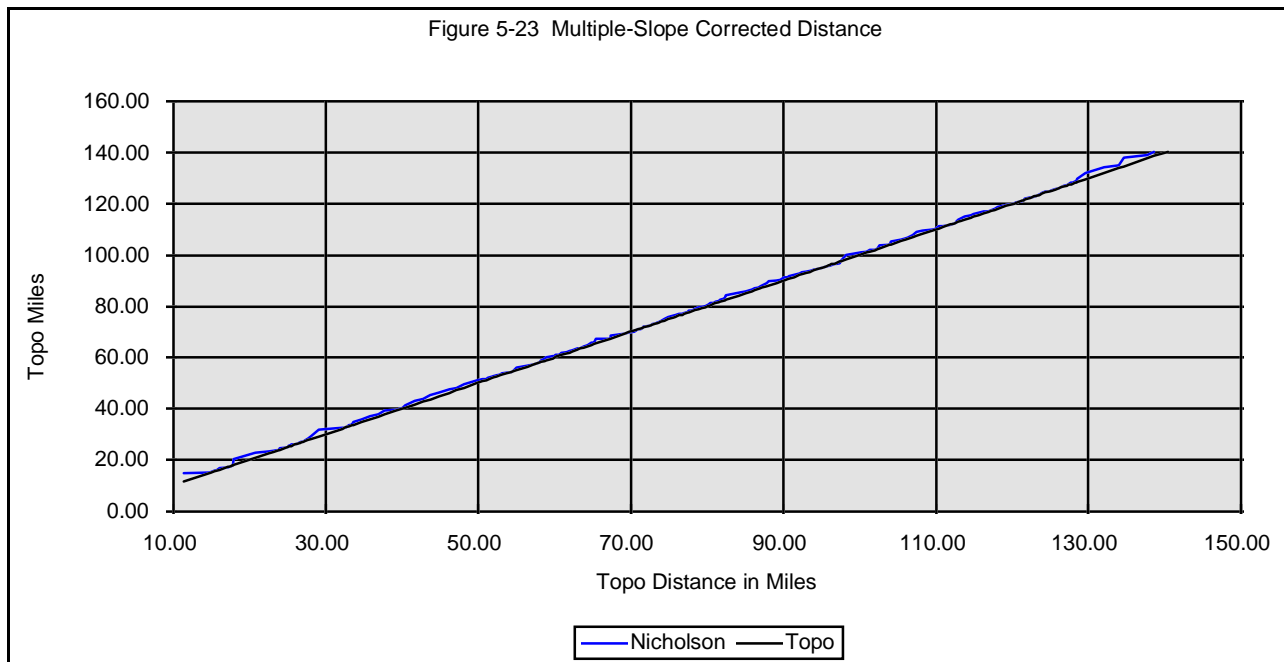


Figure 5-23 Correlation improvement obtained by multiple-slope-correction of Nicholson distances (Table 5-5, Col. 3).

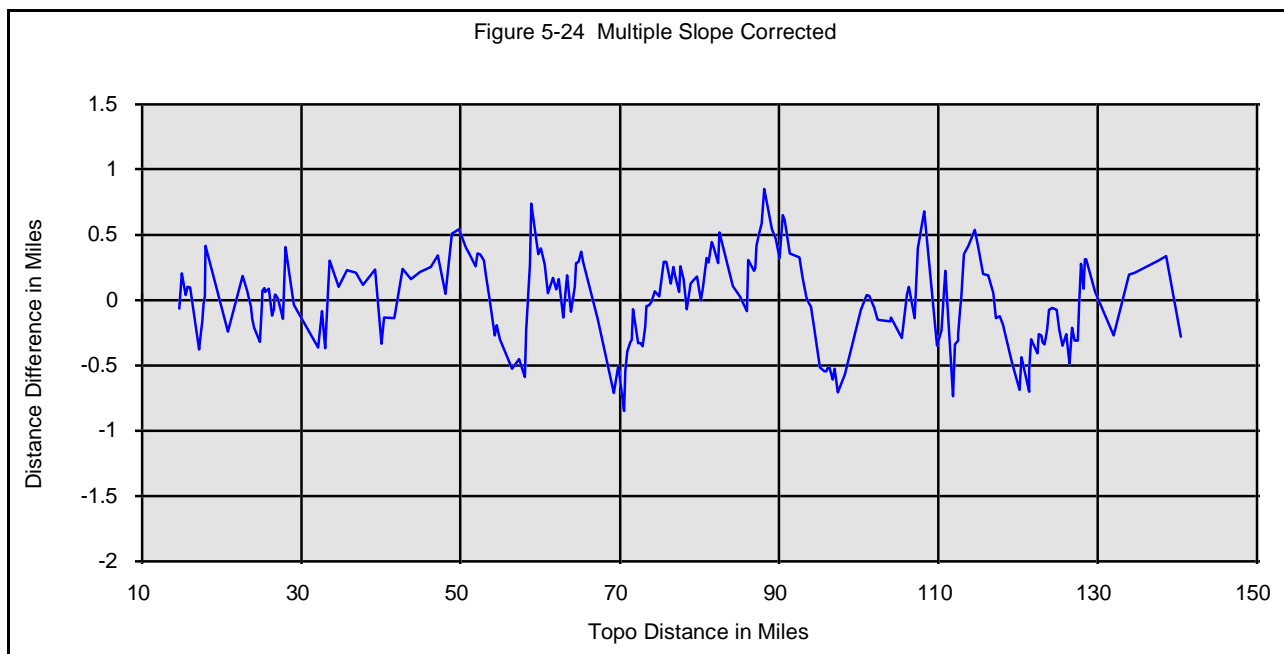


Figure 5-24 Distance differences for initial Topo data and the multiple-slope-corrected Nicholson data (Table 5-5, Col. 4).

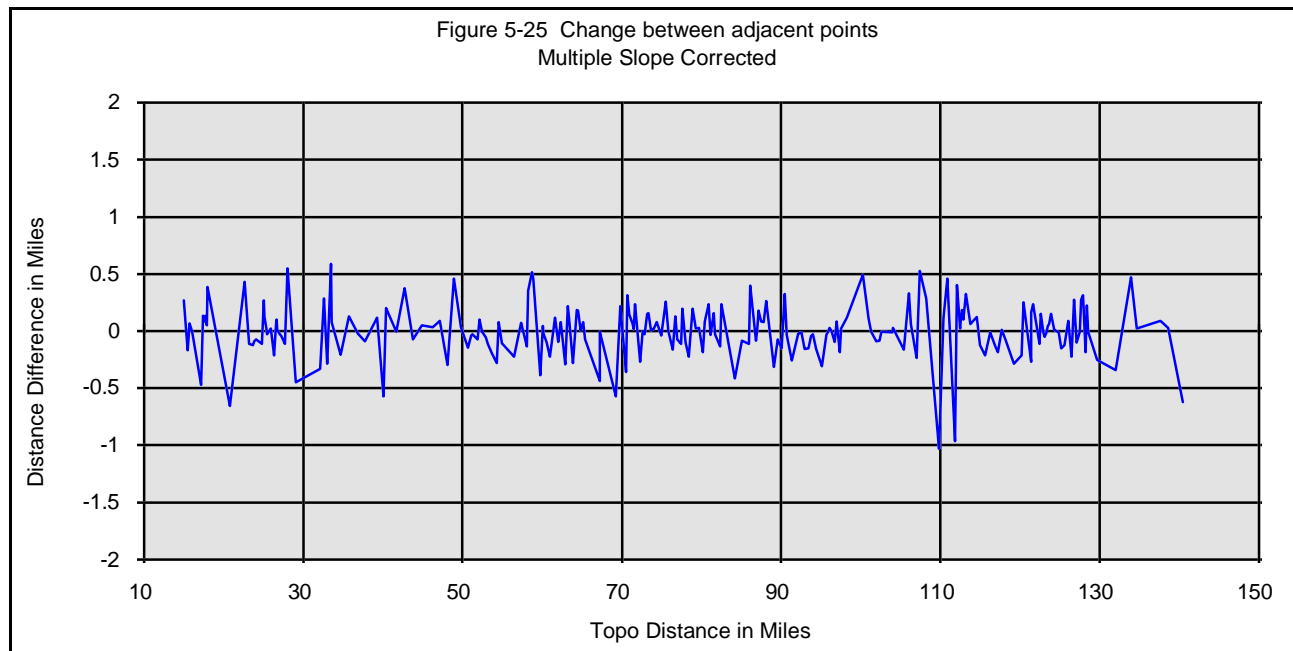


Figure 5-25 Change between adjacent points for the multiple-slope-corrected Nicholson distances (Table 5-5, Col. 6).

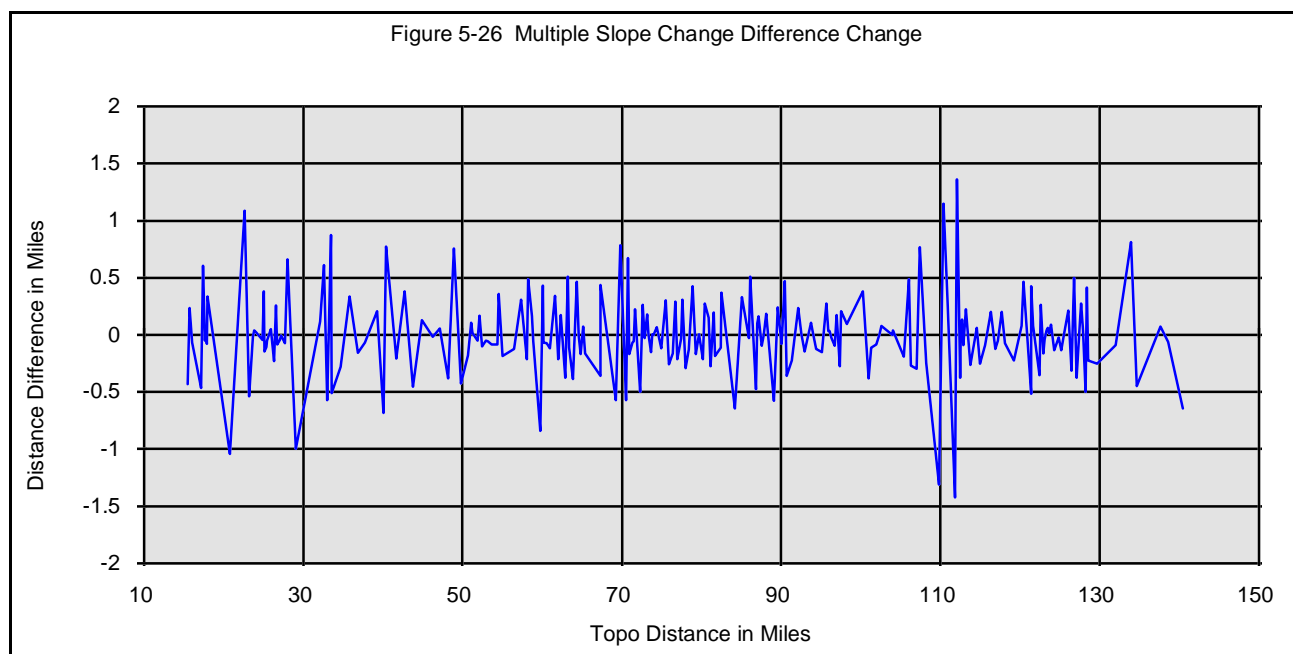


Figure 5-26 Plot of the change of the differences for the Topo distances and the modified Nicholson distances (Table 5-5, Col. 8).

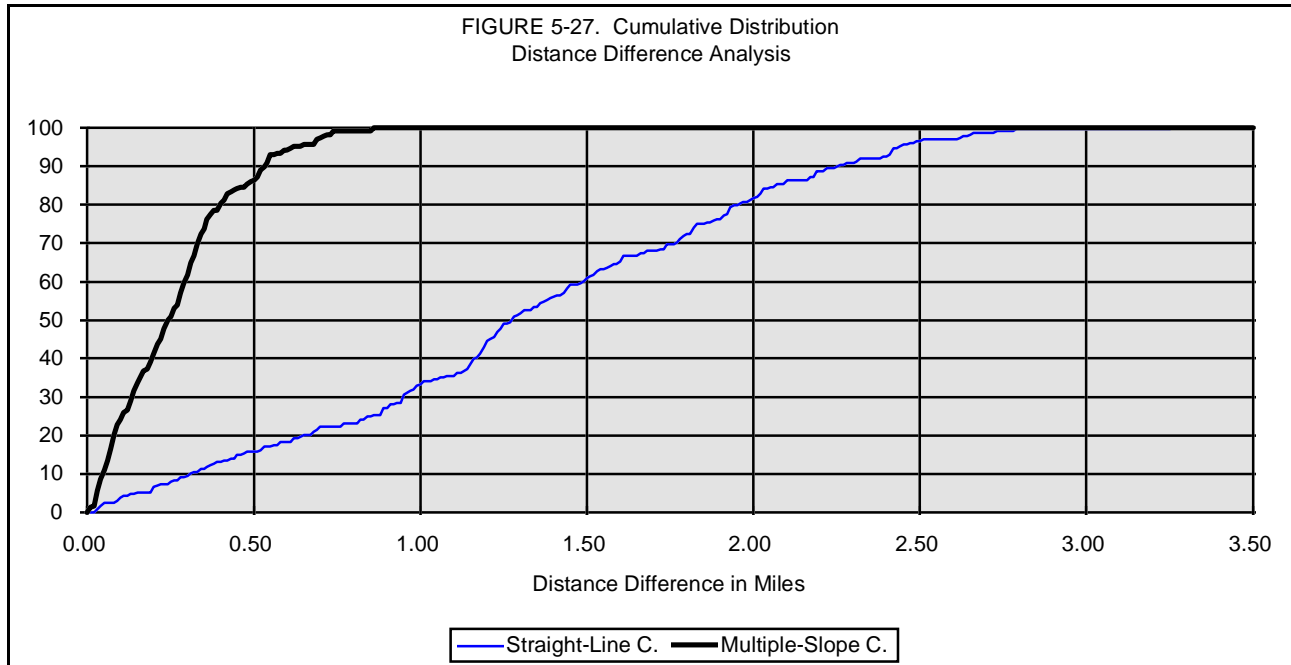


Figure 5-27 Cumulative distribution functions for the Nicholson data after single-straight-line correction and after multiple-line, multiple-slope correction.

6. COMPENSATION OF BAROMETRIC EFFECTS

Another compensation of barometric effects was implemented by first identifying 16 transition regions (distance intervals) based on previous analysis where it was determined that, within each interval, the barometric effect was relatively constant. For each beginning point in the interval, two elevation values were determined.

***continue revisions 11/19/92

The following table shows a more refined straight-line correction.

TABLE 6-1. Transition Regions, Cell References, and Adjusted Elevations for the Second Straight-Line Analysis of Elevation Data. e:\steve \trails \lolotral \research \birdtrue \nicholson\profile3.wk1 (Lotus)						
Interval No.	Cell Range	Ref. Range	Transition Region	Reference Pt. #1 Value	Beginning Interval Point	Adjusted Elevation
1	15-19	1-5	5/6	3070	1	3070

2	20-26	6-12	12/13	3160	6	3172
3	27-60	13-46	46/47	3050	13	3189
4	61-67	47-53	53/54	2870	47	5392
5	68-74	54-60	60/61	3000	54	6022
6	75-85	61-71	71/72	2870	61	6042
7	86-103/4	72-88	89/90	3000	72	6512
8	105-122	90-107	107/108	3370	90	6242
9	123-131	108-116	116/117	3520	108	7002
10	132-146	117-131	131/132	3350	117	6362
11	147-157	132-142	142/143	3150	132	6442
12	158-177	143-162	162/163	2970	143	6322
13	178-181	163-166	166/167	2780	163	5371
14	182-209	167-195	195/196	3150	167	5141
15	211-229	196-214	214/215	3070	195	3952
16	230-243	215-228	---	2960	214	3762

TABLE 6-2. Linear Regression Correction of Elevation.

> = Step Trend Change

@ = Gross Error Edit

< = Modified Cell Value

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\profile3.wk1 (lotus)

Ref. Num.		Reference Name	Topo Dist.	Corrected Elevation Nicholson		Init. Topo Elev.	Corr. Elev. Differ.
1		2	3	4		5	6
0		Weippe Prairie 3007	11.40			3020	
1		Heywood Meadows 3088	14.70	3070	<	3070	0
2		inflect up	15.00	3074		3120	-46
3		inflect up	15.45	3082		3300	-218
4		inf down	15.75	3192		3410	-218
5		Browns Creek Saddle 3396	16.00	3212		3445	-233
6	>	dip	17.20	3172	<	3195	-23
7		peak	17.35	3232		3235	-3
8		dip	17.55	3192		3205	-13
9		peak	17.70	3212		3220	-8
10		dip	17.85	3162		3185	-23
11		peak	17.95	3242		3195	47
12		shallow dip (Small Prairie)	20.75	3177		3140	37
13	>	Musselshell Prairie 3182	22.55	3189	<	3180	9
14		Musselshell Cr. Crossing	23.15	3189		3187	2
15		infl down	23.60	3422		3395	27
16		shallow peak	23.85	3432		3450	-18
17		shallow dip 3424	24.00	3392		3424	-32
18		peak 3646	24.80	3572		3646	-74
19		dip	25.00	3502		3590	-88
20		inflect down	25.10	3572		3640	-68

21		peak	25.35	3592		3690	-98
22		small dip	25.40	3572		3660	-88
23		peak	25.85	3652		3725	-73
24		Siberia Creek	26.35	3442		3445	-3
25		inflect down	26.50	3642		3680	-38
26		peak	26.65	3742		3725	17
27		inflect up	26.75	3622		3680	-58
28		Dutchman Creek	27.05	3502		3395	107
29		strange peak!	27.20	3552		3500	52
30		Lolo Forks 3389	27.65	3422		3389	33
31		inflect up	27.95	3722		3760	-38
32		inflect down 4251	29.05	4092		4251	-159
33		Ridge Camp	32.15	4481		4885	-404
34		inflect up	32.60	4682		4780	-98
35		inflect down	33.00	4762		5140	-378
36		peak	33.45	5032		5340	-308
37		Camp Martin 5144	33.60	4962		5144	-182
38		Snowy Summit	34.65	5766		6040	-274
39		inflect down	35.75	5712		6020	-308
40		Beaver Dam Saddle 5302 (41.75mi)	36.85	5182		5302	-120
41		"inflect, Squirrel Mtn 5914"	37.75	5837		5914	-77
42		Squirrel Mtn. 6257	39.25	6042		6235	-193
43		dip (runs south)	40.05	5722		5840	-118
44		peak	40.35	6022		6140	-118
45		Little Weitas Creek 5412	41.70	5312		5385	-73
46		peak	42.75	5702		5805	-103
47	>	Green Saddle	43.75	5392	<	5420	-28
48		Bowl Butte 6365	44.85	6174		6365	-191
49		Deep Saddle 5027	46.20	5062		5027	35

50		Willow Ridge 6500	47.15	6258		6500	-242
51		inflect down 5801	48.10	5942		5801	141
52		Sherman Saddle	48.95	4752		4737	15
53		inflect down 5725	49.80	5602		5725	-123
54	>	inflect down 6090	50.60	6022	<	6090	-68
55		peak 6230	51.10	6162		6230	-68
56		dip	51.20	6102		6130	-28
57		Ridge NE of Sherman Peak	51.85	6302		6260	42
58		inflect up	52.10	6002		6020	-18
59		No-See-Um Meadows 5890	52.45	5892		5890	2
60		sharp peak	52.85	6342		6320	22
61	>	inflect up	53.15	6042	<	6030	12
62		saddle 5894	53.65	5932		5894	38
63		inflect up	54.35	6012		6070	-58
64		sharp peak	54.50	6152		6140	12
65		Saddle	54.95	5902		5860	42
66		Bald Mountain	56.45	6170		6300	-130
67		saddle 5782	57.30	5782		5782	0
68		inflect down	58.05	6042		6066	-24
69		inflect down 6066	58.20	6202		6220	-18
70		small peak 6276	58.65	6232		6276	-44
71		small dip	58.85	6172		6180	-8
72	>	inflect level	59.75	6512	<	6500	12
73		inflect up	60.05	6512		6500	12
74		inflect level 6555	60.20	6552		6555	-3
75		inflect down 6554	60.60	6552		6554	-2
76		Saddle	60.95	6352		6340	12
77		Castle Rock 6592	61.65	6542		6592	-50
78		saddle	62.00	6352		6380	-28

79		Smoking Place 6574	62.35	6532		6574	-42
80		inflect	62.90	6372		6410	-38
81		Indian Grave Camp	63.20	6272		6280	-8
82		small peak	63.35	6362		6370	-8
83		Sinque Hole	63.80	6072		5980	92
84		peak 6279	64.30	6292		6279	13
85		Saddle	64.55	5972		5860	112
86		peak 6099	64.80	6142		6099	43
87		inflect down	65.15	5952		5980	-28
88		inflect up 5634	65.40	5672		5750	-78
89	@	Serpent Creek (Snow Bridge) Gulch	67.30	4632	<	4570	62
89	@	Serpent Creek (Snow Bridge) Gulch	67.30	4632	<	4570	62
90	>	inflect down	69.20	6242	<	6260	-18
91		Moccasin Peak (at saddle)	69.80	6412		6380	32
92		Howard Camp (Saddle)	70.50	6062		6070	-8
93		peak 6308	70.70	6302		6308	-6
94		saddle between	70.90	6222		6230	-8
95		peak 6635	71.30	6582		6635	-53
96		saddle	71.50	6472		6490	-18
97		peak 6658	71.65	6582		6658	-76
98		saddle 6441	72.30	6422		6441	-19
99		inflect down	72.60	6622		6620	2
100		peak 6773	72.80	6672		6673	-1
101		Moon Saddle	73.25	6092		6090	2
102		Leaning Tree Camp	73.35	6142		6140	2
103		peak 6575	73.60	6462		6575	-113
104		dip	73.80	6412		6420	-8
105		peak 6530	74.00	6462		6530	-68

106		dip	74.35	6402		6460	-58
107		inflect down	74.95	6692		6750	-58
108	>	inflect level	75.55	7002	<	7005	-3
109		Indian P.O. Peak 7033	75.85	7002		7033	-31
110		dip	76.40	6812		6810	2
111		peak 7004	76.70	6972		7004	-32
112		dip	76.95	6792		6780	12
113		peak	77.45	6912		6890	22
114		dip 6782	77.60	6782		6782	0
115		peak 6932	78.00	6922		6932	-10
116		inflect up	78.40	6642		6600	42
117	>	inflect down	78.85	6362	<	6400	-38
118		inflect up	79.30	6062		6090	-28
119		dip	79.70	6042		6090	-48
120		peak	80.10	6172		6250	-78
121		dip	80.40	6122		6160	-38
122		Spring Mtn 6306	80.85	6212		6306	-94
123		inflect up	81.10	6082		6100	-18
124		saddle	81.50	5862		5860	2
125		inflect level 6034	81.70	6012		6034	-22
126		inflect up	82.35	6012		5980	32
127		peak 6252	82.50	6182		6252	-70
128		Cayuse Junction 5342	84.20	5394		5342	52
129	@	inflect up	85.10	6022	<	6050	-28
130		inflect down	85.90	6842	<	6810	32
131		The Chief (Mt. Marcy)	86.15	6967		6890	77
132	>	saddle	86.75	6442	<	6430	12
133		inflect down	86.95	6602		6650	-48
134		peak 6879	87.20	6752		6879	-127

135		Saddle	87.50	6642		6660	-18
136		peak 6934	87.85	6792		6934	-142
137		slight dip 6723	88.10	6752		6735	17
138		slight peak 6882	89.10	6802		6882	-80
139		Saddle	89.60	6742		6740	2
140		peak	90.05	6792		7000	-208
141		Saddle	90.50	6632		6620	12
142		sharp peak 6888	90.75	6752		6850	-98
143	>	inflect up (at saddle)	91.35	6322	<	6350	-28
144		inflect level	92.10	6122		6150	-28
145		inflect down	92.50	6122		6150	-28
146	@	Papoose Saddle	93.00	5662	<	5647	15
147		inflect level 6130	93.45	6082	<	6130	-48
148		inflect down 6125	93.75	6082		6125	-43
149		"Saddle 5872, Powell Jct. Road"	93.95	5892		5872	20
150		inflect level	94.45	5972		5920	52
151		inflect down	95.10	5962		5920	42
152		Saddle 5466	95.65	5462		5466	-4
153		peak	95.95	5622		5620	2
154		dip	96.05	5572		5500	72
155		inflect down	96.35	5792		5740	52
156		inflect up	96.70	5892		5860	32
157		Rocky Point 6280	97.00	6294		6280	14
158		inflect up	97.40	5952		5870	82
159		inflect level	97.55	5862		5750	112
160		curve down 5785	98.25	5842		5785	57
161		Crooked Fork	100.25	3971		3970	1
162		inflect up	101.00	4892		4840	52
163	>	inflect down	101.35	5371	<	5360	11

164		inflect up	102.00	5502		5500	2
165		inflect level	102.30	5642		5640	2
166		inflect down 5661	102.65	5642		5640	2
167	>	Pack Creek	103.95	5141	<	5140	1
168		L&C Glade Creek Camp	104.05	5152		5150	2
169		Cross Pack Creek	105.45	5214		5199	15
170		Lolo Pass (circa 1912)	106.05	5232		5254	-22
171		dip (West Fork Lolo Cr.)	106.30	5182		5190	-8
172		inflect down	107.00	5362		5410	-48
173		Wagon Mountain	107.40	5522		5570	-48
174		inflect down	108.20	5292		5490	-198
175		inflect down	109.85	4922		4900	22
176		West Fork Lolo Creek	110.35	4212		4241	-29
177		peak	110.90	4452		4600	-148
178		inflect up	111.90	4212		4200	12
179		inflect level	112.10	4082		4160	-78
180		Lolo Hot Springs	112.45	4082		4150	-68
181		inflect down	112.55	4232		4360	-128
182		peak	112.70	4262		4410	-148
183		dip	112.90	4072		4140	-68
184		L&C 9/12/92	113.25	4152		4230	-78
185		peak	113.75	4202		4270	-68
186		2 Fords of Lolo Creek	114.60	4022		4045	-23
187		inflect up steeply 4034	114.95	4022		4040	-18
188		inflect down	115.65	4832		4900	-68
189		inflect level	116.30	5072		5160	-88
190		inflect up	116.85	5082		5180	-98
191		peak	117.30	5162		5240	-78
192		dip	117.70	4732		4800	-68

193		peak	118.10	4772		4840	-68
194		inflect down	119.25	4422		4500	-78
195		Howard Cr. 3851 (Mullans Camp)	120.25	3938		3860	78
196	>	peak	120.45	3952	<	3970	-18
197		dip (creek from North)	121.35	3882		3875	7
198		peak	121.45	3942		3935	7
199		Hungry Creek (inflect up)	121.70	3842		3835	7
200		Grave Creek	122.45	3802		3790	12
201		peak	122.60	4062		4090	-28
202		dip	122.95	3952		3945	7
203		peak	123.15	4062		4055	7
204		dip	123.35	4022		4015	7
205		inflect level	123.45	4112		4105	7
206		inflect down	123.65	4112		4105	7
207		Clark Creek	123.95	3952		3945	7
208		peak	124.35	4242		4250	-8
209		Potato Gulch	124.85	4102		4095	7
210		peak	125.15	4232		4225	7
211		Sheldon Creek	125.65	4072		4065	7
212		peak	126.05	4152		4175	-23
213		Smith Creek	126.50	4112		4105	7
214		peak	126.75	4182		4175	7
215	>	Bear Creek	127.15	3762	<	3760	2
216		peak	127.45	4012		4100	-88
217		Camp Creek	127.70	3842		3840	2
218		inflect up	127.95	3942		3885	57
219		peak	128.25	4012		3980	32
220		dip	128.40	3922		3920	2
221		peak	128.55	3992		4020	-28

222		Woodman Creek 3542	129.65	3592		3580	12
223		L&C Camp? 11/11/05	132.05	3522		3460	62
224		inflect down	133.95	3422		3390	32
225		inflect up 3356	134.65	3332		3356	-24
226		Elev. Ref.	137.65	3322		3240	82
227		L&C Camp? 6/30/06	138.65	3302		3200	102
228		Bitter Root River	140.45	3222		3155	67

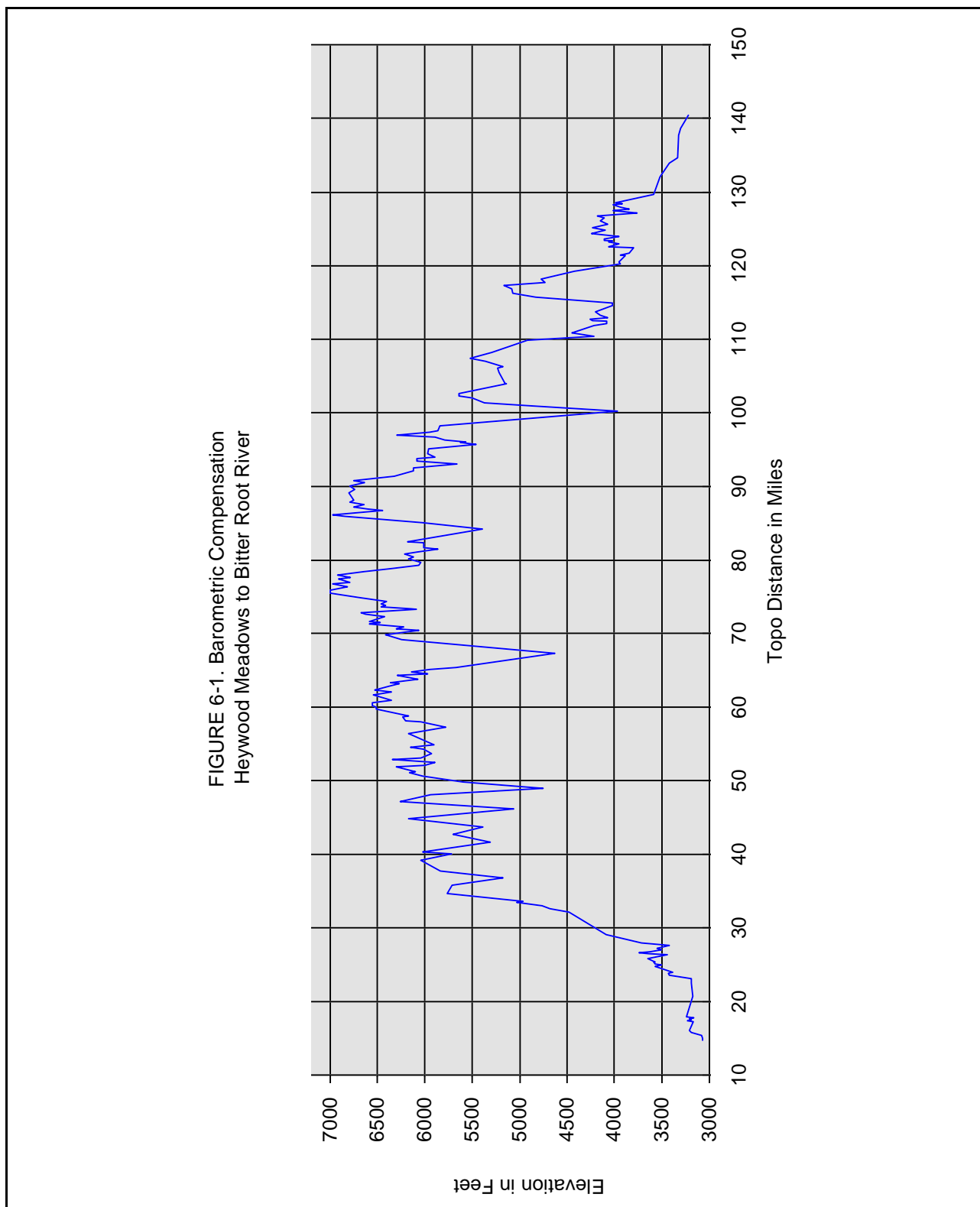


Figure 6-1 Multiple-line, multiple-slope correction of barometric effects - Heywood Meadows to Bitter Root River.

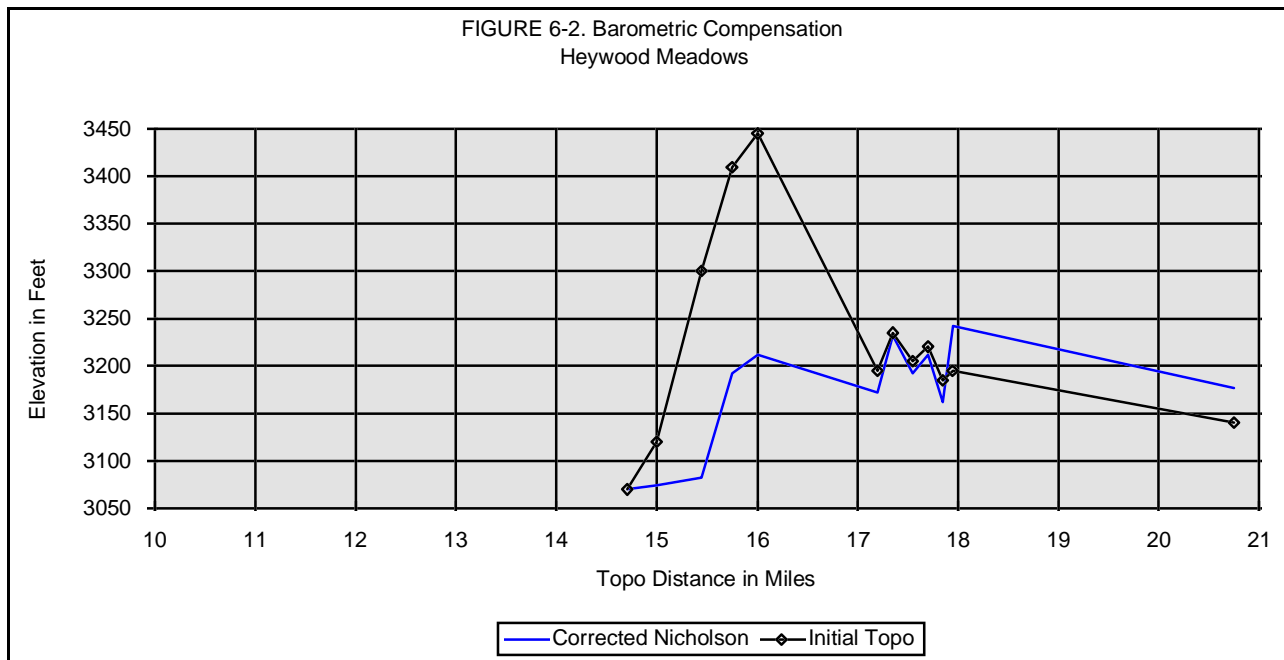


Figure 6-2 Multiple-line, multiple-slope correction of barometric effects - Heywood Meadows.

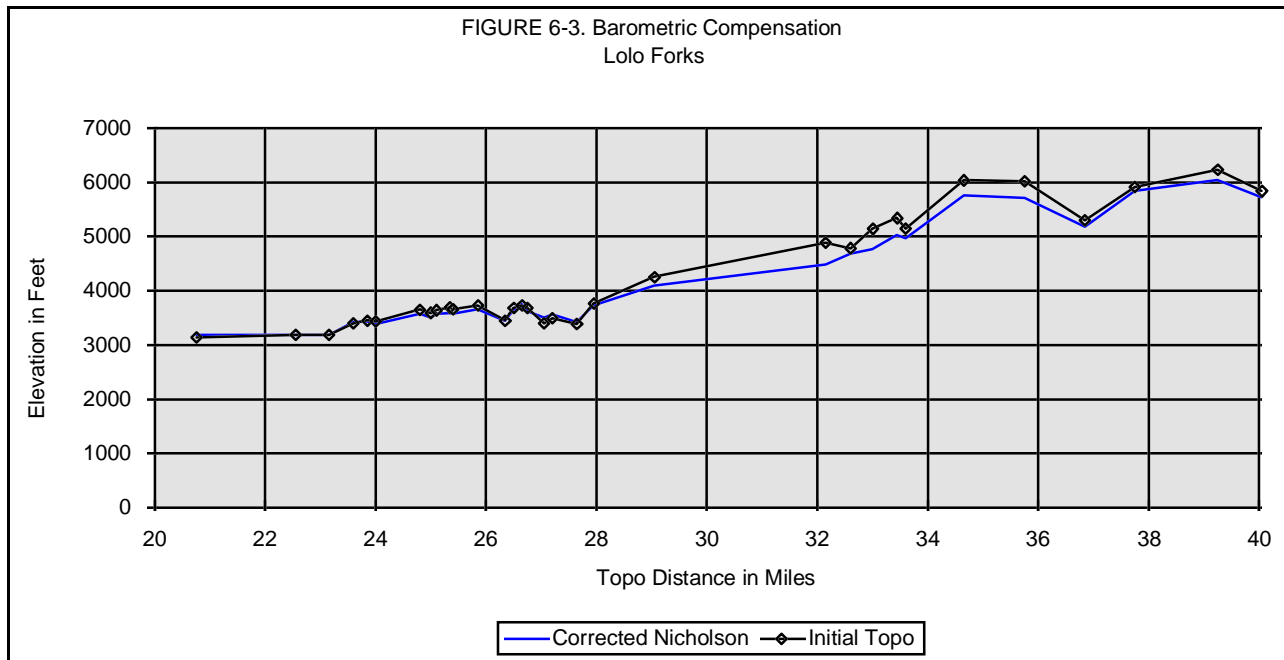


Figure 6-3 Multiple-line, multiple-slope correction of barometric effects - Lolo Forks.

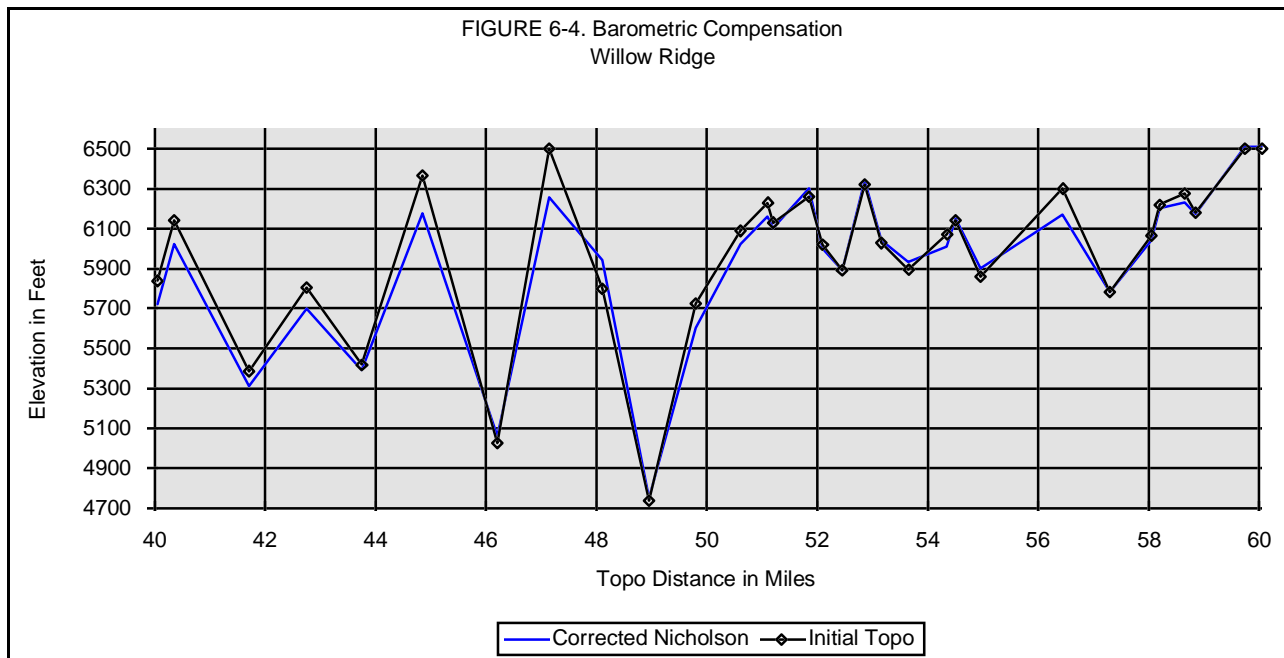


Figure 6-4 Multiple-line, multiple-slope correction of barometric effects - Willow Ridge.

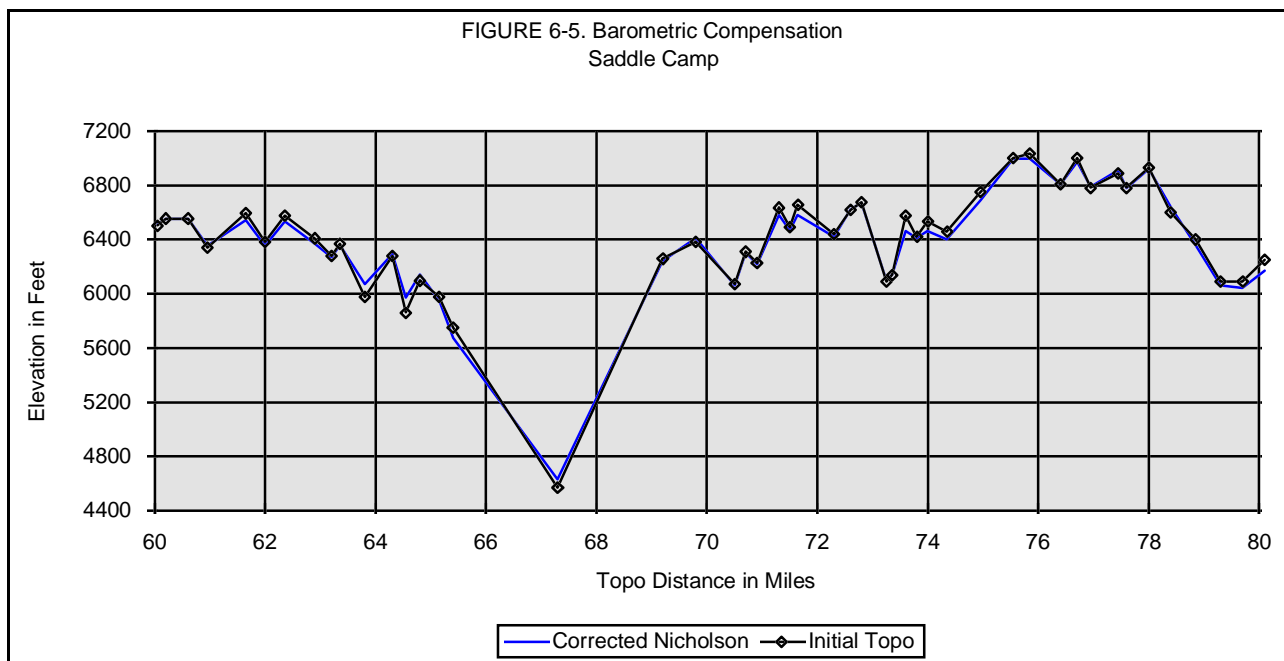


Figure 6-5 Multiple-line, multiple-slope correction of barometric effects - Saddle Camp.

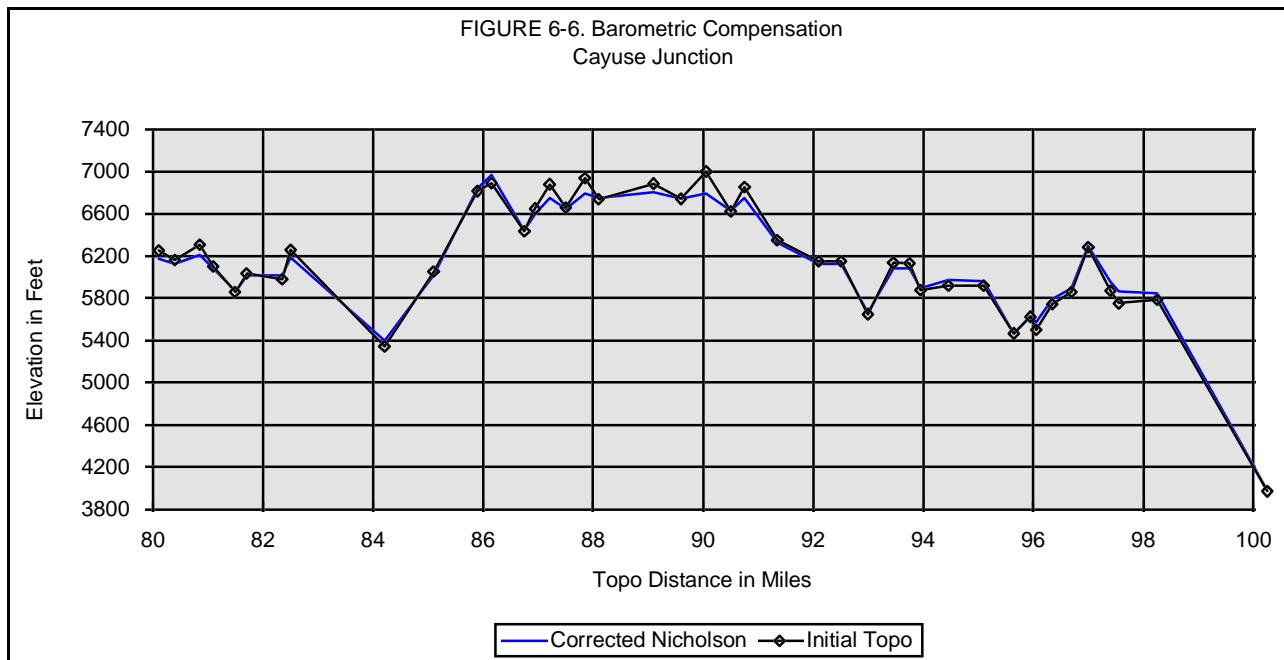


Figure 6-6 Multiple-line, multiple-slope correction of barometric effects - Cayuse Junction.

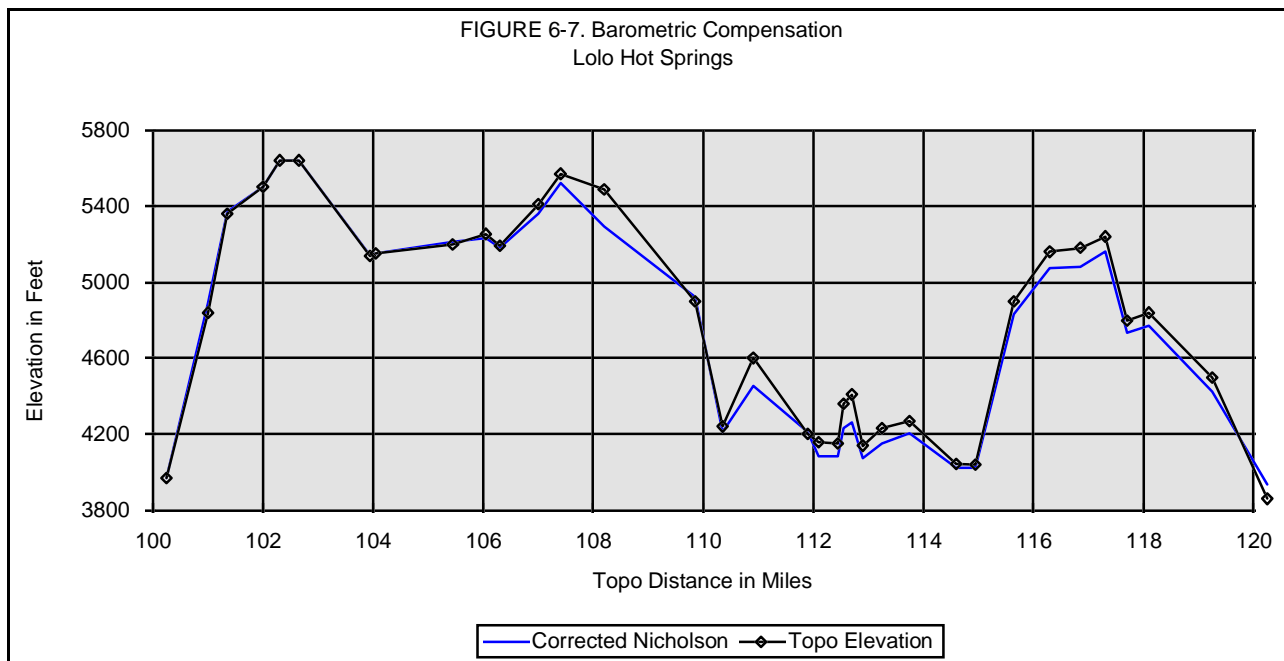


Figure 6-7 Multiple-line, multiple-slope correction of barometric effects - Lolo Hot Springs.

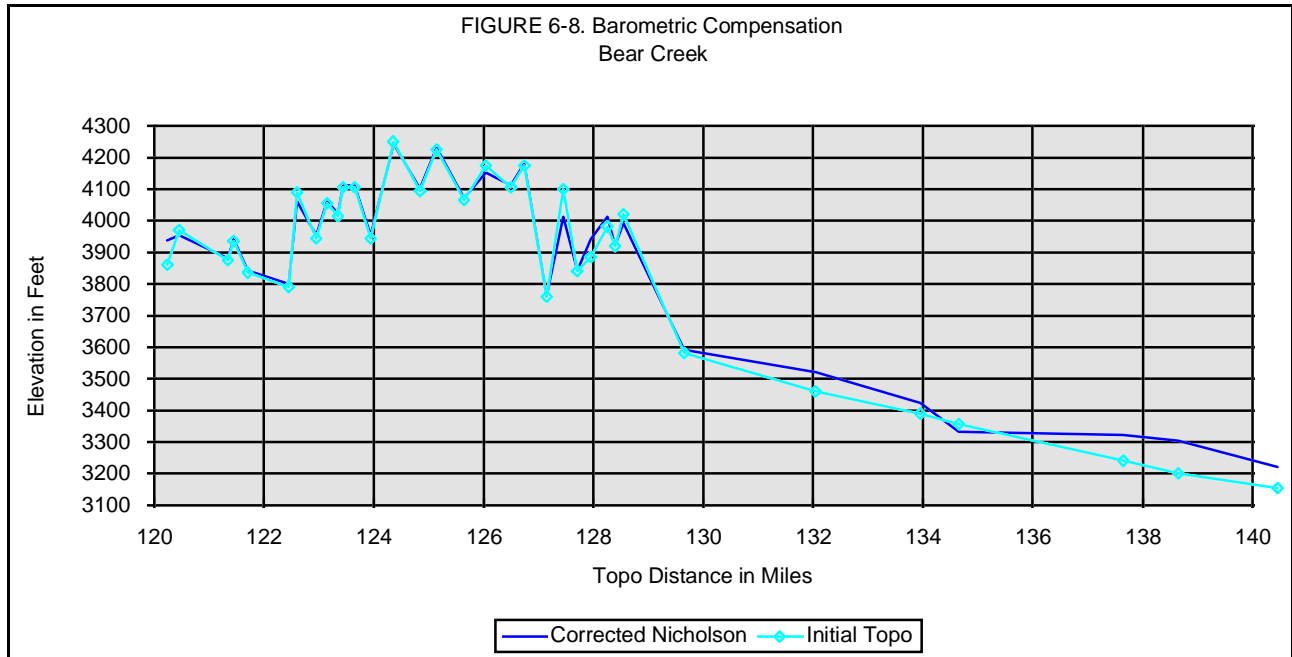


Figure 6-8 Multiple-line, multiple-slope correction of barometric effects - Bear Creek.

TABLE 6-3. Straight-Line Correction of Nicholson Elevation Data.								
e:\steve \trails \lolotral \research \birdtrue \nicholsn \profile3.wk1 (Lotus)								
Ref. Num.		Reference Name	Topo Dist. Miles	Corr. Elev. Nich.	St. Line Corr. Elev.		Init. Topo Elev.	Corr. Elev. Diff.
1		2	3	4	5		6	7
0		Weippe Prairie 3007	11.40				3020	
1		Heywood Meadows 3088	14.70	3070	3066	<	3070	-4
2		inflect up	15.00	3074	3124		3120	4
3		inflect up	15.45	3082	3213		3300	-87
4		inf down	15.75	3192	3377		3410	-33
5		Browns Creek Saddle 3396	16.00	3212	3442		3445	-3
6	>	dip	17.20	3172	3194	<	3195	-1

7		peak	17.35	3232	3252		3235	17
8		dip	17.55	3192	3209		3205	4
9		peak	17.70	3212	3227		3220	7
10		dip	17.85	3162	3174		3185	-11
11		peak	17.95	3242	3253		3195	58
12		shallow dip (Small Prairie)	20.75	3177	3146		3140	6
13	>	Musselshell Prairie 3182	22.55	3189	3169	<	3180	-11
14		Musselshell Cr. Crossing	23.15	3189	3174		3187	-13
15		infl down	23.60	3422	3411		3395	16
16		shallow peak	23.85	3432	3423		3450	-27
17		shallow dip 3424	24.00	3392	3384		3424	-40
18		peak 3646	24.80	3572	3570		3646	-76
19		dip	25.00	3502	3502		3590	-88
20		inflect down	25.10	3572	3573		3640	-67
21		peak	25.35	3592	3595		3690	-95
22		small dip	25.40	3572	3575		3660	-85
23		peak	25.85	3652	3659		3725	-66
24		Siberia Creek	26.35	3442	3453		3445	8
25		inflect down	26.50	3642	3654		3680	-26
26		peak	26.65	3742	3755		3725	30
27		inflect up	26.75	3622	3636		3680	-44
28		Dutchman Creek	27.05	3502	3518		3395	123
29		strange peak!	27.20	3552	3570		3500	70
30		Lolo Forks 3389	27.65	3422	3443		3389	54
31		inflect up	27.95	3722	3746		3760	-14
32		inflect down 4251	29.05	4092	4124		4251	-127
33		Ridge Camp	32.15	4481	4538		4885	-347
34		inflect up	32.60	4682	4743		4780	-37
35		inflect down	33.00	4762	4826		5140	-314

36		peak	33.45	5032	5100		5340	-240
37		Camp Martin 5144	33.60	4962	5031		5144	-113
38		Snowy Summit	34.65	5766	5843		6040	-197
39		inflect down	35.75	5712	5798		6020	-222
40		Beaver Dam Saddle 5302 (41.75mi)	36.85	5182	5277		5302	-25
41		"inflect, Squirrel Mtn 5914"	37.75	5837	5939		5914	25
42		Squirrel Mtn. 6257	39.25	6042	6156		6235	-79
43		dip (runs south)	40.05	5722	5842		5840	2
44		peak	40.35	6022	6145		6140	5
45		Little Weitas Creek 5412	41.70	5312	5446		5385	61
46		peak	42.75	5702	5844		5805	39
47	>	Green Saddle	43.75	5392	5398	<	5420	-22
48		Bowl Butte 6365	44.85	6174	6175		6365	-190
49		Deep Saddle 5027	46.20	5062	5056		5027	29
50		Willow Ridge 6500	47.15	6258	6247		6500	-253
51		inflect down 5801	48.10	5942	5927		5801	126
52		Sherman Saddle	48.95	4752	4732		4737	-5
53		inflect down 5725	49.80	5602	5578		5725	-147
54	>	inflect down 6090	50.60	6022	6067	<	6090	-23
55		peak 6230	51.10	6162	6195		6230	-36
56		dip	51.20	6102	6132		6130	2
57		Ridge NE of Sherman Peak	51.85	6302	6316		6260	56
58		inflect up	52.10	6002	6010		6020	-11
59		No-See-Um Meadows 5890	52.45	5892	5891		5890	1
60		sharp peak	52.85	6342	6331		6320	11
61	>	inflect up	53.15	6042	5997	<	6030	-33
62		saddle 5894	53.65	5932	5892		5894	-2
63		inflect up	54.35	6012	5980		6070	-90
64		sharp peak	54.50	6152	6122		6140	-19

65		Saddle	54.95	5902	5876		5860	16
66		Bald Mountain	56.45	6170	6161		6300	-139
67		saddle 5782	57.30	5782	5782		5782	0
68		inflect down	58.05	6042	6051		6066	-15
69		inflect down 6066	58.20	6202	6212		6220	-8
70		small peak 6276	58.65	6232	6247		6276	-29
71		small dip	58.85	6172	6189		6180	9
72	>	inflect level	59.75	6512	6536	<	6500	36
73		inflect up	60.05	6512	6531		6500	31
74		inflect level 6555	60.20	6552	6569		6555	14
75		inflect down 6554	60.60	6552	6563		6554	9
76		Saddle	60.95	6352	6358		6340	18
77		Castle Rock 6592	61.65	6542	6537		6592	-55
78		saddle	62.00	6352	6342		6380	-38
79		Smoking Place 6574	62.35	6532	6517		6574	-57
80		inflect	62.90	6372	6349		6410	-62
81		Indian Grave Camp	63.20	6272	6244		6280	-36
82		small peak	63.35	6362	6332		6370	-38
83		Sinque Hole	63.80	6072	6035		5980	55
84		peak 6279	64.30	6292	6248		6279	-32
85		Saddle	64.55	5972	5924		5860	64
86		peak 6099	64.80	6142	6090		6099	-9
87		inflect down	65.15	5952	5895		5980	-85
88		inflect up 5634	65.40	5672	5611		5750	-139
89	@	Serpent Creek (Snow Bridge) Gulch	67.30	4632	4543	<	4570	-28
89	@	Serpent Creek (Snow Bridge) Gulch	67.30	4632	4543	<	4570	-28
90	>	inflect down	69.20	6242	6234	<	6260	-26
91		Moccasin Peak (at saddle)	69.80	6412	6410		6380	30
92		Howard Camp (Saddle)	70.50	6062	6067		6070	-3

93		peak 6308	70.70	6302	6309		6308	1
94		saddle between	70.90	6222	6231		6230	1
95		peak 6635	71.30	6582	6595		6635	-40
96		saddle	71.50	6472	6487		6490	-3
97		peak 6658	71.65	6582	6599		6658	-60
98		saddle 6441	72.30	6422	6445		6441	4
99		inflect down	72.60	6622	6648		6620	28
100		peak 6773	72.80	6672	6700		6673	27
101		Moon Saddle	73.25	6092	6125		6090	35
102		Leaning Tree Camp	73.35	6142	6176		6140	36
103		peak 6575	73.60	6462	6498		6575	-77
104		dip	73.80	6412	6450		6420	30
105		peak 6530	74.00	6462	6502		6530	-28
106		dip	74.35	6402	6446		6460	-15
107		inflect down	74.95	6692	6742		6750	-9
108	>	inflect level	75.55	7002	7001	<	7005	-4
109		Indian P.O. Peak 7033	75.85	7002	7000		7033	-33
110		dip	76.40	6812	6809		6810	-1
111		peak 7004	76.70	6972	6969		7004	-35
112		dip	76.95	6792	6788		6780	8
113		peak	77.45	6912	6907		6890	17
114		dip 6782	77.60	6782	6777		6782	-5
115		peak 6932	78.00	6922	6916		6932	-16
116		inflect up	78.40	6642	6635		6600	35
117	>	inflect down	78.85	6362	6425	<	6400	25
118		inflect up	79.30	6062	6116		6090	26
119		dip	79.70	6042	6088		6090	-2
120		peak	80.10	6172	6210		6250	-40
121		dip	80.40	6122	6154		6160	-6

122		Spring Mtn 6306	80.85	6212	6235		6306	-71
123		inflect up	81.10	6082	6100		6100	0
124		saddle	81.50	5862	5872		5860	12
125		inflect level 6034	81.70	6012	6018		6034	-16
126		inflect up	82.35	6012	6005		5980	25
127		peak 6252	82.50	6182	6172		6252	-80
128		Cayuse Junction 5342	84.20	5394	5350		5342	8
129	@	inflect up	85.10	6022	5960	<	6050	-90
130		inflect down	85.90	6842	6764	<	6810	-46
131		The Chief (Mt. Marcy)	86.15	6967	6884		6890	-6
132	>	saddle	86.75	6442	6426	<	6430	-4
133		inflect down	86.95	6602	6587		6650	-63
134		peak 6879	87.20	6752	6738		6879	-141
135		Saddle	87.50	6642	6630		6660	-31
136		peak 6934	87.85	6792	6781		6934	-153
137		slight dip 6723	88.10	6752	6743		6735	8
138		slight peak 6882	89.10	6802	6798		6882	-85
139		Saddle	89.60	6742	6740		6740	0
140		peak	90.05	6792	6792		7000	-208
141		Saddle	90.50	6632	6635		6620	15
142		sharp peak 6888	90.75	6752	6756		6850	-94
143	>	inflect up (at saddle)	91.35	6322	6343	<	6350	-7
144		inflect level	92.10	6122	6137		6150	-13
145		inflect down	92.50	6122	6135		6150	-16
146	@	Papoose Saddle	93.00	5662	5671	<	5647	24
147		inflect level 6130	93.45	6082	6088	<	6130	-42
148		inflect down 6125	93.75	6082	6086		6125	-39
149		"Saddle 5872, Powell Jct. Road"	93.95	5892	5894		5872	22
150		inflect level	94.45	5972	5971		5920	51

151		inflect down	95.10	5962	5956		5920	36
152		Saddle 5466	95.65	5462	5452		5466	-14
153		peak	95.95	5622	5610		5620	-10
154		dip	96.05	5572	5560		5500	60
155		inflect down	96.35	5792	5778		5740	38
156		inflect up	96.70	5892	5875		5860	15
157		Rocky Point 6280	97.00	6294	6275		6280	-5
158		inflect up	97.40	5952	5930		5870	60
159		inflect level	97.55	5862	5839		5750	89
160		curve down 5785	98.25	5842	5814		5785	29
161		Crooked Fork	100.25	3971	3929		3970	-41
162		inflect up	101.00	4892	4845		4840	5
163	>	inflect down	101.35	5371	5371	<	5360	11
164		inflect up	102.00	5502	5502		5500	2
165		inflect level	102.30	5642	5642		5640	2
166		inflect down 5661	102.65	5642	5642		5640	2
167	>	Pack Creek	103.95	5141	5163	<	5140	23
168		L&C Glade Creek Camp	104.05	5152	5174		5150	24
169		Cross Pack Creek	105.45	5214	5240		5199	41
170		Lolo Pass (circa 1912)	106.05	5232	5260		5254	6
171		dip (West Fork Lolo Cr.)	106.30	5182	5211		5190	21
172		inflect down	107.00	5362	5393		5410	-17
173		Wagon Mountain	107.40	5522	5554		5570	-16
174		inflect down	108.20	5292	5327		5490	-163
175		inflect down	109.85	4922	4962		4900	62
176		West Fork Lolo Creek	110.35	4212	4253		4241	12
177		peak	110.90	4452	4495		4600	-105
178		inflect up	111.90	4212	4258		4200	58
179		inflect level	112.10	4082	4128		4160	-32

180		Lolo Hot Springs	112.45	4082	4129		4150	-21
181		inflect down	112.55	4232	4280		4360	-80
182		peak	112.70	4262	4310		4410	-100
183		dip	112.90	4072	4121		4140	-19
184		L&C 9/12/92	113.25	4162	4212		4230	-18
185		peak	113.75	4202	4253		4270	-17
186		2 Fords of Lolo Creek	114.60	4022	4076		4045	31
187		inflect up steeply 4034	114.95	4022	4077		4040	37
188		inflect down	115.65	4832	4889		4900	-11
189		inflect level	116.30	5072	5131		5160	-29
190		inflect up	116.85	5082	5143		5180	-37
191		peak	117.30	5162	5224		5240	-16
192		dip	117.70	4732	4795		4800	-5
193		peak	118.10	4772	4836		4840	-4
194		inflect down	119.25	4422	4490		4500	-10
195		Howard Cr. 3851 (Mullans Camp)	120.25	3938	4009		3860	149
196	>	peak	120.45	3952	3942	<	3970	-28
197		dip (creek from North)	121.35	3882	3872		3875	-3
198		peak	121.45	3942	3932		3935	-3
199		Hungry Creek (inflect up)	121.70	3842	3832		3835	-3
200		Grave Creek	122.45	3802	3792		3790	2
201		peak	122.60	4062	4052		4090	-38
202		dip	122.95	3952	3942		3945	-3
203		peak	123.15	4062	4052		4055	-3
204		dip	123.35	4022	4012		4015	-3
205		inflect level	123.45	4112	4102		4105	-3
206		inflect down	123.65	4112	4102		4105	-3
207		Clark Creek	123.95	3952	3942		3945	-3
208		peak	124.35	4242	4232		4250	-18

209	Potato Gulch	124.85	4102	4092		4095	-3
210	peak	125.15	4232	4222		4225	-3
211	Sheldon Creek	125.65	4072	4062		4065	-3
212	peak	126.05	4152	4142		4175	-33
213	Smith Creek	126.50	4112	4102		4105	-3
214	peak	126.75	4182	4172		4175	-3
215	> Bear Creek	127.15	3762	3766	<	3760	6
216	peak	127.45	4012	4015		4100	-85
217	Camp Creek	127.70	3842	3844		3840	4
218	inflect up	127.95	3942	3942		3885	57
219	peak	128.25	4012	4011		3980	31
220	dip	128.40	3922	3920		3920	0
221	peak	128.55	3992	3989		4020	-31
222	Woodman Creek 3542	129.65	3592	3584		3580	4
223	L&C Camp? 11/11/05	132.05	3522	3502		3460	42
224	inflect down	133.95	3422	3392		3390	2
225	inflect up 3356	134.65	3332	3299		3356	-57
226	Elev. Ref.	137.65	3322	3274		3240	34
227	L&C Camp? 6/30/06	138.65	3302	3249		3200	49
228	Bitter Root River	140.45	3222	3160		3155	5

Table 6-4. Corrective Factors for the Additive Straight Line

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 \birdtrue \nicholsn \profile3.wk1 (Lotus)

Ref. Num.	Slope	Intercept
1	180.0	-2650
6	-15.0	280

13	8.0	-200
47	-5.0	225
54	-25.0	1310
61	11.0	-630
72	-15.0	920
90	10.0	-700
108	-2.0	150
117	-20.0	1640
132	5.0	-450
143	-7.0	660
163	0.0	0
167	3.0	-290
195	0.0	-10
214	-5.0	640

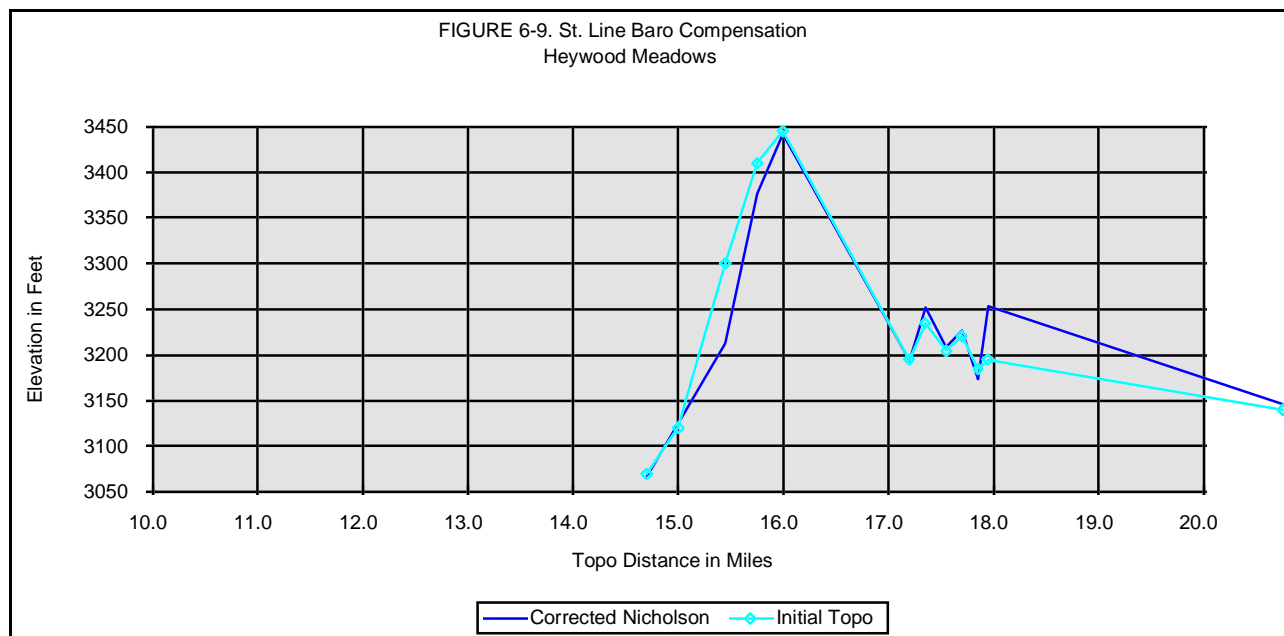


Figure 6-9

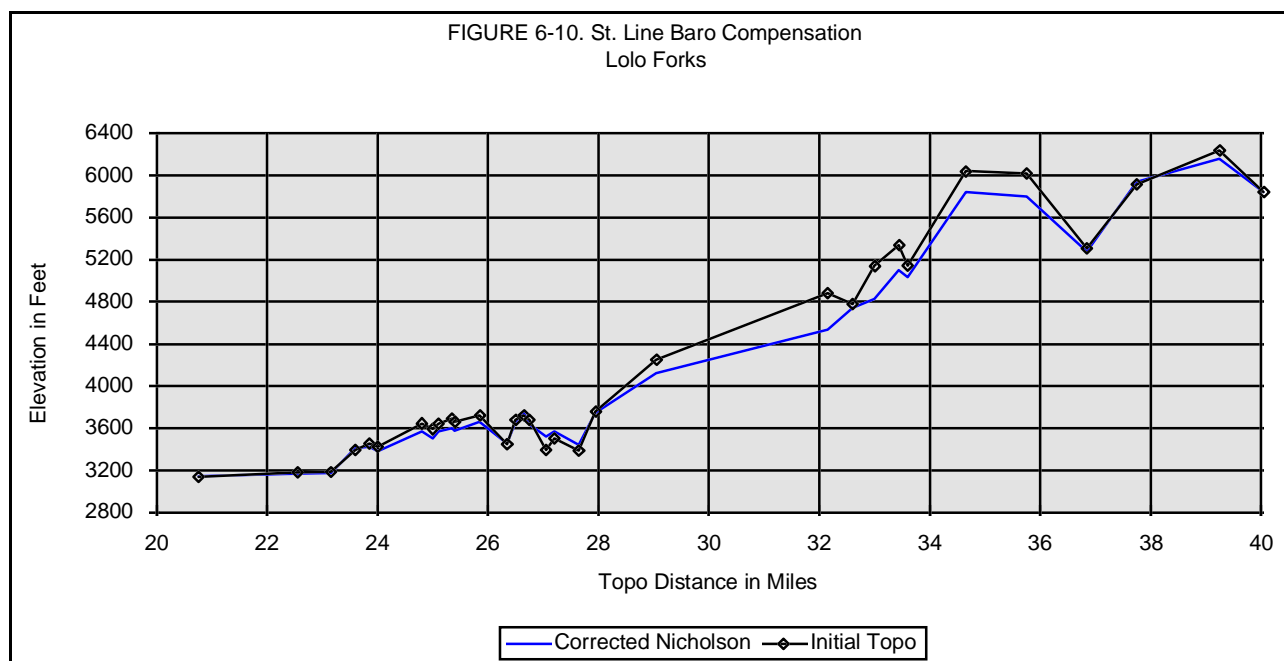


Figure 6-10

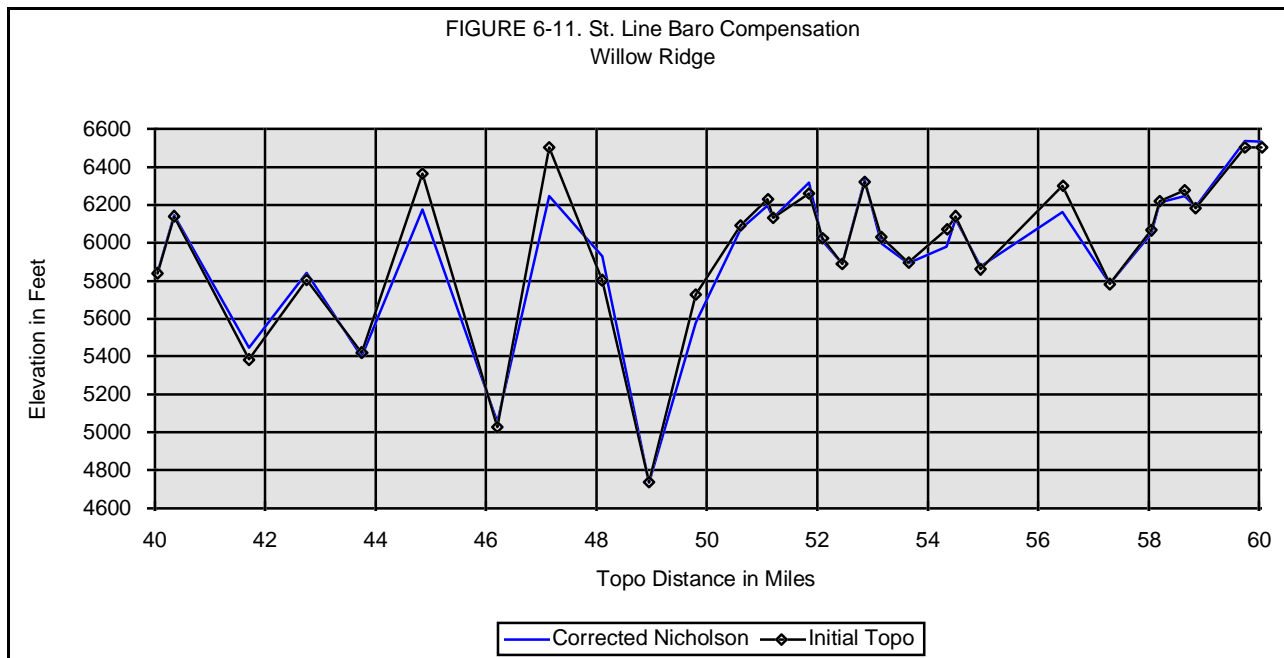


Figure 6-11

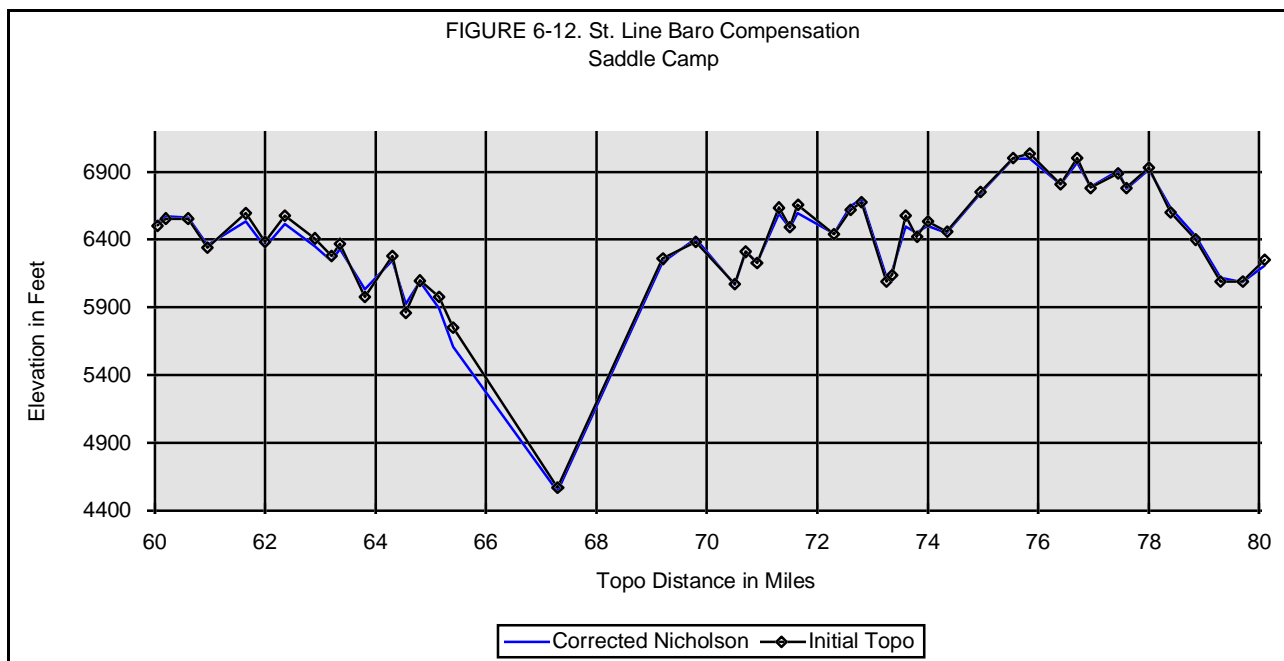


Figure 6-12

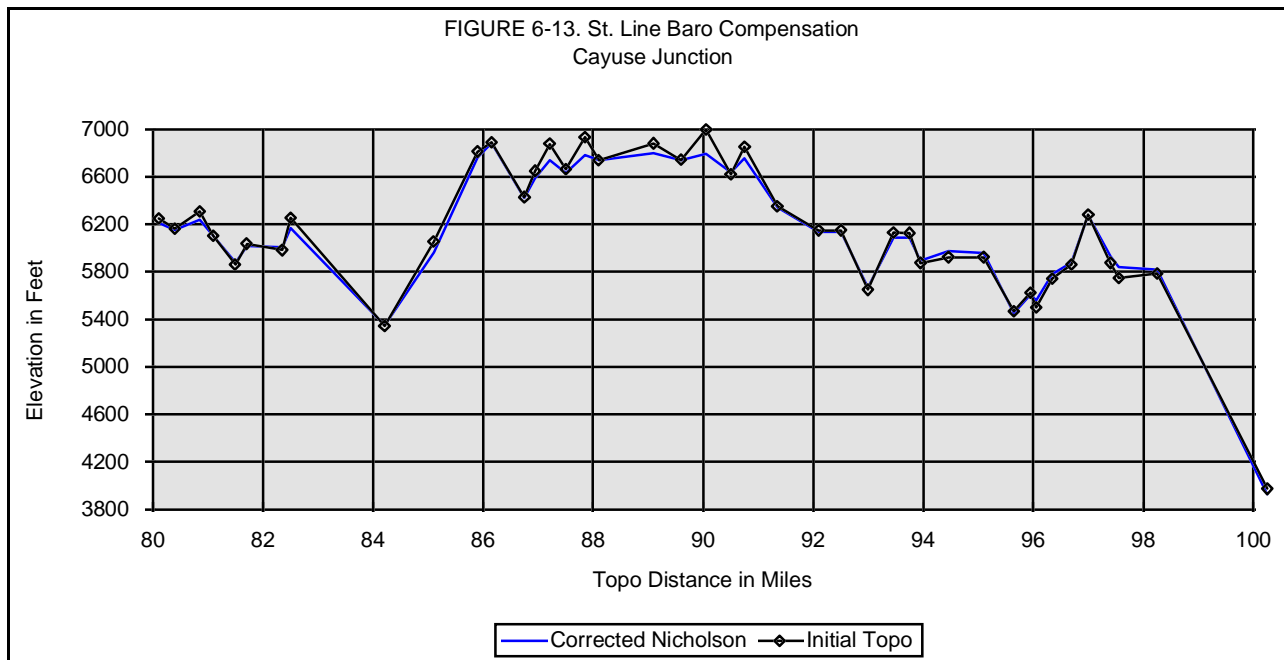


Figure 6-13

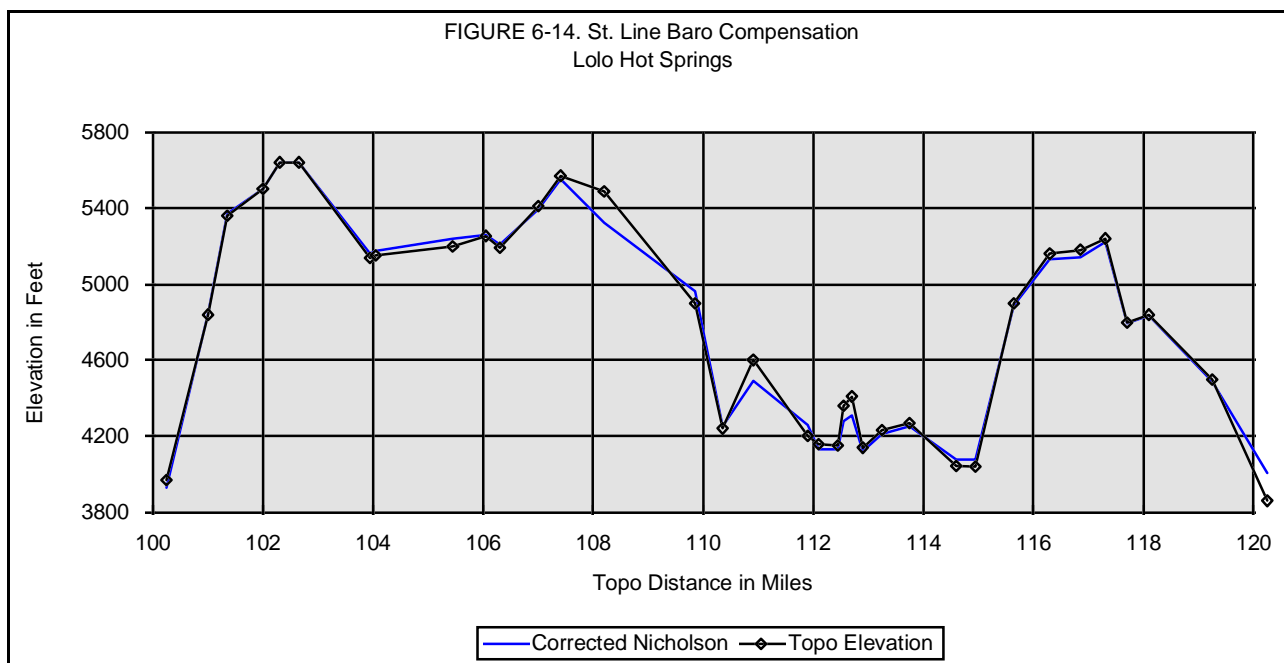


Figure 6-14

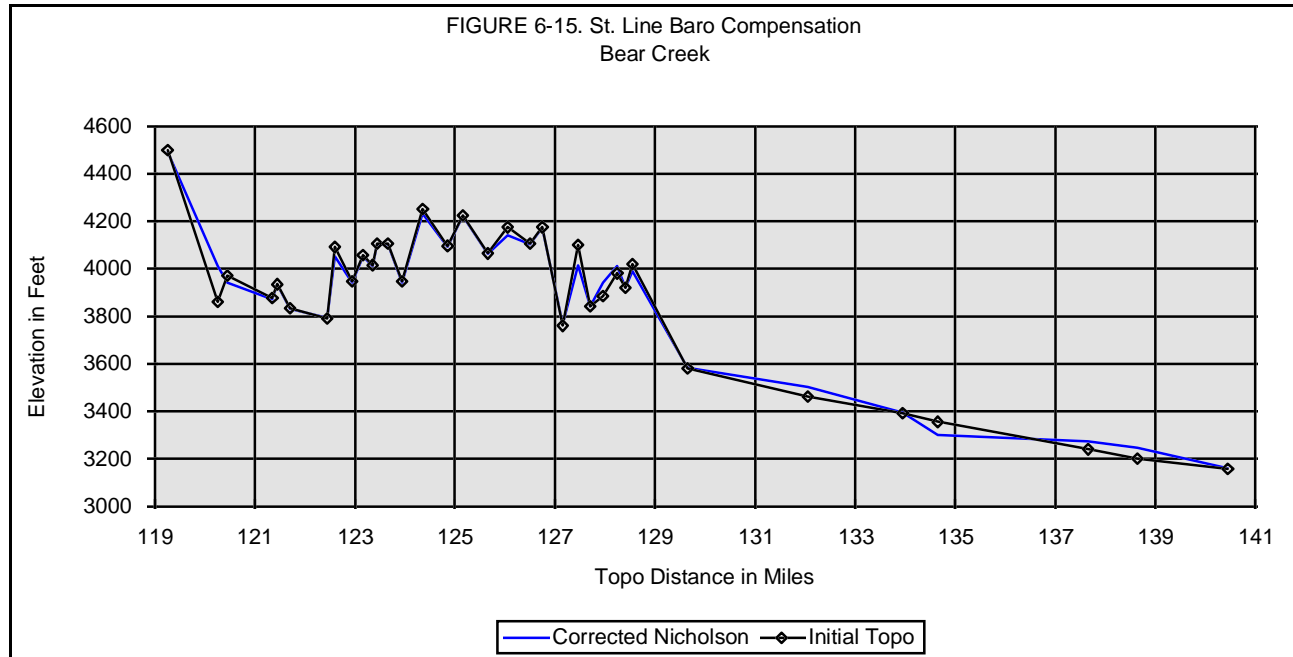


Figure 6-15

7. FINAL ANALYSIS OF DATA

NOTE: Technique for detailed tread location determination:

The distance from one point to another forms the "topographic radius". The topographic radius and the elevation of the destinate point form a "somewhat" unique solution to the location of the destination location. Usually the topographic radius is only an estimate of the true distance. It is an estimate in two senses: the data from nicholson will have errors and the measurements on the topo maps are approximations.

TABLE 7-1. Final Correction of Distance							
e:\steve \trails \lolotral \research \birdtrue \nicholsn \profile4.wk1 (Lotus)							
Ref. Num.	Reference Name	Corr. Nich. Dist.	Final Topo Dist.	Dist. Diff.	Nich. Chng.	Topo Chng.	Chng. Diff.
1	2	3	4	5	6	7	8
0	Weippe Prairie 3007		12.10				
1	Heywood Meadows 3088	14.64	14.50	0.14		2.40	
2	inflect up	15.21	15.05	0.15	0.57	0.55	0.02
3	inflect up	15.49	15.55	-0.06	0.28	0.50	-0.22
4	inf down	15.85	15.85	0.00	0.36	0.30	0.06
5	Browns Creek Saddle 3396	16.10	16.00	0.10	0.24	0.15	0.09
6	dip	16.83	17.20	-0.38	0.73	1.20	-0.47
7	peak	17.11	17.35	-0.24	0.28	0.15	0.13
8	dip	17.39	17.55	-0.16	0.28	0.20	0.08
9	peak	17.68	17.70	-0.02	0.28	0.15	0.13
10	dip	17.88	17.85	0.03	0.20	0.15	0.05
11	peak	18.36	17.95	0.41	0.49	0.10	0.39
12	shallow dip (Small Prairie)	20.51	20.75	-0.24	2.15	2.80	-0.65
13	Musselshell Prairie 3182	22.74	22.55	0.19	2.23	1.80	0.43
14	Musselshell Cr. Crossing	23.22	23.15	0.07	0.49	0.60	-0.11
15	infl down	23.55	23.60	-0.05	0.32	0.45	-0.13
16	shallow peak	23.71	23.85	-0.14	0.16	0.25	-0.09
17	shallow dip 3424	23.79	24.00	-0.21	0.08	0.15	-0.07
18	peak 3646	24.48	24.80	-0.32	0.69	0.80	-0.11
19	dip	24.95	25.00	-0.05	0.47	0.20	0.27
20	inflect down	25.17	25.10	0.07	0.23	0.10	0.13
21	peak	25.44	25.35	0.09	0.27	0.25	0.02
22	small dip	25.46	25.40	0.06	0.02	0.05	-0.03
23	peak	25.94	25.85	0.09	0.47	0.45	0.02
24	Siberia Creek	26.23	26.35	-0.12	0.29	0.50	-0.21
25	inflect down	26.43	26.50	-0.07	0.20	0.15	0.05
26	peak	26.68	26.65	0.03	0.25	0.15	0.10
27	inflect up	26.79	26.75	0.04	0.11	0.10	0.01
28	Dutchman Creek	27.06	27.05	0.01	0.27	0.30	-0.03
29	strange peak!	27.17	27.20	-0.03	0.11	0.15	-0.04

30	Lolo Forks 3389	27.51	27.65	-0.14	0.34	0.45	-0.11
31	inflect up	28.36	27.95	0.41	0.85	0.30	0.55
32	inflect down 4251	29.01	29.05	-0.04	0.65	1.10	-0.45
33	Ridge Camp (Cold Spring)	31.79	31.85	-0.06	2.77	2.80	-0.03
34	inflect up	32.52	32.40	0.12	0.73	0.55	0.18
35	inflect down	32.63	32.65	-0.02	0.12	0.25	-0.13
36	peak	33.67	33.45	0.22	1.04	0.80	0.24
37	Camp Martin 5144	33.90	33.60	0.30	0.23	0.15	0.08
38	Snowy Summit	34.75	34.65	0.10	0.85	1.05	-0.20
39	inflect down	35.98	35.75	0.23	1.23	1.10	0.13
40	Beaver Dam Saddle 5302 (41.75mi)	37.06	36.85	0.21	1.08	1.10	-0.02
41	"inflect, Squirrel Mtn 5914"	37.87	37.75	0.12	0.81	0.90	-0.09
42	Squirrel Mtn. 6257	39.49	39.25	0.24	1.62	1.50	0.12
43	dip (runs south)	39.72	40.05	-0.33	0.23	0.80	-0.57
44	peak	40.22	40.35	-0.13	0.50	0.30	0.20
45	Little Weitas Creek 5412	41.56	41.70	-0.14	1.35	1.35	0.00
46	peak (near Butte Camp)	42.99	42.75	0.24	1.42	1.05	0.37
47	Green Saddle	43.91	43.75	0.16	0.92	1.00	-0.08
48	Bowl Butte 6365	45.07	44.85	0.22	1.16	1.10	0.05
49	Deep Saddle 5027	46.45	46.20	0.25	1.39	1.35	0.04
50	Willow Ridge 6481	47.49	47.15	0.34	1.04	0.95	0.09
51	inflect down	48.15	47.95	0.20	0.65	0.80	-0.15
52	Sherman Saddle	49.46	49.60	-0.14	1.31	1.65	-0.34
53	inflect down 5725	50.34	50.45	-0.11	0.89	0.85	0.04
54	inflect down 6090	51.00	50.90	0.10	0.65	0.45	0.20
55	peak 6230	51.46	51.40	0.06	0.46	0.50	-0.04
56	dip	51.54	51.50	0.04	0.08	0.10	-0.02
57	Ridge NE of Sherman Peak	52.11	52.15	-0.04	0.58	0.65	-0.07
58	inflect up	52.46	52.40	0.06	0.35	0.25	0.10
59	No-See-Um Meadows 5890	52.81	52.75	0.06	0.35	0.35	0.00
60	sharp peak	53.15	53.15	0.00	0.35	0.40	-0.05
61	inflect up	53.35	53.45	-0.10	0.19	0.30	-0.11
62	saddle 5894	53.65	53.80	-0.15	0.31	0.35	-0.04
63	inflect up	54.08	54.30	-0.22	0.42	0.50	-0.08
64	sharp peak	54.31	54.60	-0.29	0.23	0.30	-0.07
65	Saddle	54.65	55.15	-0.50	0.35	0.55	-0.20
66	Bald Mountain	55.93	56.75	-0.83	1.27	1.60	-0.33

67	saddle 5782	56.85	57.60	-0.75	0.92	0.85	0.07
68	inflect down 6066	57.47	58.30	-0.84	0.62	0.70	-0.08
69	inflect down	57.97	58.50	-0.53	0.50	0.20	0.30
70	small peak 6276	58.93	58.95	-0.02	0.96	0.45	0.51
71	small dip	59.59	59.15	0.44	0.66	0.20	0.46
72	inflect level	60.10	60.05	0.05	0.52	0.90	-0.38
73	inflect up	60.45	60.35	0.10	0.34	0.30	0.04
74	inflect level 6555	60.58	60.50	0.07	0.13	0.15	-0.02
75	inflect down 6554	60.88	60.90	-0.02	0.30	0.40	-0.10
76	Saddle	61.01	61.25	-0.25	0.13	0.35	-0.22
77	Castle Rock 6592	61.82	62.00	-0.18	0.82	0.75	0.07
78	saddle	62.08	62.30	-0.22	0.26	0.30	-0.04
79	Smoking Place 6574	62.51	62.65	-0.14	0.43	0.35	0.08
80	inflect up	62.77	62.90	-0.13	0.26	0.25	0.01
81	Indian Grave Camp	63.28	63.50	-0.22	0.52	0.60	-0.08
82	small peak	63.54	63.65	-0.11	0.26	0.15	0.11
83	Sinque Hole	63.71	64.10	-0.39	0.17	0.45	-0.28
84	peak 6279	64.40	64.60	-0.20	0.69	0.50	0.19
85	Saddle	64.83	64.85	-0.02	0.43	0.25	0.18
86	peak 6099	65.09	65.10	-0.01	0.26	0.25	0.01
87	inflect down	65.52	65.55	-0.03	0.43	0.45	-0.02
88	inflect up 5634	65.69	66.10	-0.41	0.17	0.55	-0.38
89	Serpent Creek (Snow Bridge) Gulch	67.15	67.60	-0.45	1.46	1.50	-0.04
89	Serpent Creek (Snow Bridge) Gulch	67.15	67.60	-0.45	0.00	0.00	0.00
90	inflect down	68.49	69.50	-1.01	1.33	1.90	-0.57
91	Moccasin Peak (at saddle)	69.30	70.10	-0.80	0.82	0.60	0.22
92	Howard Camp (Meadow)	69.65	70.70	-1.05	0.34	0.60	-0.26
93	peak 6308	70.16	71.00	-0.84	0.52	0.30	0.22
94	saddle between	70.51	71.20	-0.69	0.34	0.20	0.14
95	peak 6635	70.98	71.60	-0.62	0.47	0.40	0.07
96	saddle	71.20	71.80	-0.60	0.22	0.20	0.02
97	peak 6658	71.58	71.95	-0.37	0.39	0.15	0.24
98	saddle 6441	71.97	72.60	-0.63	0.39	0.65	-0.26
99	inflect down	72.27	72.80	-0.53	0.30	0.20	0.10
100	peak 6773	72.44	73.05	-0.61	0.17	0.25	-0.08
101	Moon Saddle	73.05	73.55	-0.50	0.60	0.50	0.10
102	Leaning Tree Camp	73.30	73.65	-0.35	0.26	0.10	0.16

103	peak 6575	73.56	73.90	-0.34	0.26	0.25	0.01
104	dip	73.78	74.10	-0.32	0.22	0.20	0.02
105	peak 6530	73.99	74.30	-0.31	0.22	0.20	0.02
106	dip	74.42	74.65	-0.23	0.43	0.35	0.08
107	inflect down	74.98	75.25	-0.27	0.56	0.60	-0.04
108	inflect level	75.84	75.80	0.04	0.86	0.55	0.31
109	Indian P.O. Peak 7033	76.14	76.10	0.04	0.30	0.30	0.00
110	dip	76.53	76.60	-0.07	0.39	0.50	-0.11
111	peak 7004	76.96	76.90	0.06	0.43	0.30	0.13
112	dip	77.13	77.15	-0.02	0.17	0.25	-0.08
113	peak	77.52	77.65	-0.13	0.39	0.50	-0.11
114	dip 6782	77.86	77.80	0.06	0.34	0.15	0.19
115	peak 6932	78.16	78.20	-0.04	0.30	0.40	-0.10
116	inflect up	78.33	78.60	-0.27	0.17	0.40	-0.23
117	inflect down	78.98	79.05	-0.07	0.64	0.45	0.20
118	inflect up	79.45	79.50	-0.05	0.47	0.45	0.02
119	dip	79.88	79.90	-0.02	0.43	0.40	0.03
120	peak	80.10	80.30	-0.20	0.22	0.40	-0.18
121	dip	80.48	80.55	-0.07	0.39	0.25	0.14
122	Spring Mtn 6306	81.17	80.95	0.22	0.69	0.40	0.29
123	inflect up	81.39	81.30	0.09	0.22	0.35	-0.13
124	saddle	81.95	81.70	0.25	0.56	0.40	0.16
125	inflect level 6034	82.12	81.90	0.22	0.17	0.20	-0.03
126	inflect up	82.63	82.35	0.28	0.52	0.45	0.07
127	peak 6252	83.02	82.70	0.32	0.39	0.35	0.04
128	Cayuse Junction 5342	84.31	84.40	-0.09	1.29	1.70	-0.41
129	inflect up	85.13	85.30	-0.17	0.82	0.90	-0.08
130	inflect down	85.82	86.10	-0.28	0.69	0.80	-0.11
131	The Chief (Mt. Marcy)	86.46	86.35	0.11	0.64	0.25	0.39
132	saddle	86.98	86.95	0.03	0.52	0.60	-0.08
133	inflect down	87.19	87.15	0.04	0.22	0.20	0.02
134	peak 6879	87.62	87.40	0.22	0.43	0.25	0.18
135	Saddle	88.01	87.70	0.31	0.39	0.30	0.09
136	peak 6934	88.44	88.05	0.39	0.43	0.35	0.08
137	slight dip	88.96	88.55	0.41	0.52	0.50	0.02
138	slight peak 6882	89.64	89.30	0.34	0.69	0.75	-0.06
139	Saddle	90.07	89.70	0.37	0.43	0.40	0.03

140	peak	90.37	90.00	0.37	0.30	0.30	0.00
141	Saddle	91.15	90.70	0.45	0.77	0.70	0.07
142	sharp peak 6888	91.36	90.95	0.41	0.22	0.25	-0.03
143	inflect up (at saddle)	91.71	91.55	0.16	0.34	0.60	-0.26
144	inflect level	92.44	92.30	0.14	0.73	0.75	-0.02
145	inflect down	92.83	92.70	0.13	0.39	0.40	-0.01
146	Papoose Saddle	93.17	93.15	0.02	0.34	0.45	-0.11
147	inflect level 6130	93.47	93.65	-0.18	0.30	0.50	-0.20
148	inflect down	93.73	93.90	-0.17	0.26	0.25	0.01
149	"Saddle 5872, Powell Jct. Road"	93.90	94.15	-0.25	0.17	0.25	-0.08
150	inflect level	94.24	94.65	-0.41	0.34	0.50	-0.16
151	inflect down	94.59	95.20	-0.61	0.34	0.55	-0.21
152	Saddle 5466	95.10	95.85	-0.75	0.52	0.65	-0.13
153	peak	95.41	96.15	-0.74	0.30	0.30	0.00
154	dip	95.53	96.20	-0.67	0.13	0.05	0.08
155	inflect down	95.84	96.55	-0.71	0.30	0.35	-0.05
156	inflect up	96.09	96.95	-0.86	0.26	0.40	-0.14
157	Rocky Point 6280	96.48	97.20	-0.72	0.39	0.25	0.14
158	inflect up	96.70	97.50	-0.80	0.22	0.30	-0.08
159	inflect level	96.87	97.65	-0.78	0.17	0.15	0.02
160	curve down 5785	97.68	98.45	-0.77	0.82	0.80	0.02
161	Crooked Fork	100.18	100.45	-0.27	2.49	2.00	0.49
162	inflect up	101.04	101.20	-0.16	0.86	0.75	0.11
163	inflect down	101.38	101.60	-0.22	0.34	0.40	-0.06
164	inflect up	101.94	102.25	-0.31	0.56	0.65	-0.09
165	inflect level	102.16	102.50	-0.34	0.22	0.25	-0.03
166	inflect down 5661	102.50	102.75	-0.25	0.34	0.25	0.09
167	Pack Creek	103.79	104.15	-0.36	1.29	1.40	-0.11
168	L&C Glade Creek Camp	103.92	104.75	-0.83	0.13	0.60	-0.47
169	Pack Creek (N5292)	105.16	105.65	-0.49	1.24	0.90	0.34
170	Lolo Pass (circa 1912)	106.09	106.25	-0.16	0.93	0.60	0.33
171	dip (West Fork Lolo Cr.)	106.40	106.50	-0.10	0.31	0.25	0.06
172	inflect down	106.87	107.20	-0.33	0.46	0.70	-0.24
173	Wagon Mountain	107.80	107.60	0.20	0.93	0.40	0.53
174	inflect down	108.88	108.50	0.38	1.09	0.90	0.19
175	inflect down	109.50	109.20	0.30	0.62	0.70	-0.08
176	West Fork Lolo Creek	110.12	110.25	-0.13	0.62	1.05	-0.43

177	peak	111.13	110.85	0.28	1.01	0.60	0.41
178	inflect up	111.17	111.75	-0.58	0.04	0.90	-0.86
179	inflect level	111.77	112.10	-0.33	0.60	0.35	0.25
180	Lolo Hot Springs	112.14	112.50	-0.36	0.38	0.40	-0.02
181	inflect down	112.29	112.65	-0.36	0.15	0.15	0.00
182	peak	112.63	112.85	-0.22	0.34	0.20	0.14
183	Granite Creek	112.93	113.00	-0.07	0.30	0.15	0.15
184	L&C Camp 09/12/05	113.61	113.35	0.26	0.68	0.35	0.33
185	peak	114.17	113.80	0.37	0.56	0.45	0.11
186	2 Fords of Lolo Creek	115.14	115.30	-0.16	0.98	1.50	-0.52
187	inflect up steeply 4034	115.37	115.30	0.07	0.23	0.00	0.23
188	inflect down	115.85	116.00	-0.15	0.49	0.70	-0.21
189	inflect level	116.49	116.65	-0.16	0.64	0.65	-0.01
190	inflect up	116.90	117.20	-0.30	0.41	0.55	-0.14
191	peak	117.17	117.65	-0.48	0.26	0.45	-0.19
192	dip	117.58	118.05	-0.47	0.41	0.40	0.01
193	peak	117.92	118.45	-0.53	0.34	0.40	-0.06
194	inflect down	118.78	119.60	-0.82	0.86	1.15	-0.29
195	Howard Cr. 3851 (Mullans Camp)	119.57	120.60	-1.03	0.79	1.00	-0.21
196	peak	120.02	121.05	-1.03	0.45	0.45	0.00
197	dip (creek from North)	120.65	121.70	-1.05	0.64	0.65	-0.01
198	peak	120.92	121.85	-0.93	0.26	0.15	0.11
199	Hungry Creek (inflect up)	121.40	122.15	-0.75	0.49	0.30	0.19
200	Grave Creek	122.04	122.90	-0.86	0.64	0.75	-0.11
201	peak	122.34	123.20	-0.86	0.30	0.30	0.00
202	dip	122.68	123.40	-0.72	0.34	0.20	0.14
203	peak	122.83	123.65	-0.82	0.15	0.25	-0.10
204	dip	123.02	123.80	-0.78	0.19	0.15	0.04
205	inflect level	123.17	123.90	-0.73	0.15	0.10	0.05
206	inflect down	123.43	124.20	-0.77	0.26	0.30	-0.04
207	Clark Creek	123.88	124.30	-0.42	0.45	0.10	0.35
208	peak	124.29	124.75	-0.46	0.41	0.45	-0.04
209	Potato Gulch	124.78	125.20	-0.42	0.49	0.45	0.04
210	peak	124.93	125.50	-0.57	0.15	0.30	-0.15
211	Sheldon Creek	125.30	126.00	-0.70	0.38	0.50	-0.12
212	peak	125.79	126.50	-0.71	0.49	0.50	-0.01
213	Smith Creek	126.02	126.90	-0.88	0.23	0.40	-0.17

214	peak	126.54	127.10	-0.56	0.52	0.20	0.32
215	Bear Creek	126.84	127.55	-0.71	0.30	0.45	-0.15
216	peak	127.14	127.90	-0.76	0.30	0.35	-0.05
217	Camp Creek	127.67	128.15	-0.48	0.52	0.25	0.27
218	inflect up	128.23	128.35	-0.12	0.56	0.20	0.36
219	peak	128.34	128.45	-0.11	0.11	0.10	0.01
220	dip	128.72	128.60	0.12	0.38	0.15	0.22
221	peak	128.87	128.75	0.12	0.15	0.15	0.00
222	Woodman Creek 3542	129.72	129.85	-0.13	0.85	1.10	-0.25
223	L&C Camp? 11/11/05	131.78	131.85	-0.07	2.06	2.00	0.06
224	inflect down	134.15	134.25	-0.10	2.37	2.40	-0.03
225	inflect up 3356	134.87	135.00	-0.13	0.72	0.75	-0.03
226	Elev. Ref.	137.96	138.00	-0.04	3.09	3.00	0.09
227	L&C Camp? 6/30/06	138.99	139.00	-0.01	1.03	1.00	0.03
228	Bitter Root River	140.17	140.70	-0.53	1.18	1.70	-0.52

TABLE 7-2. Final Correction of Elevation

e:\steve \trails \lolotral \research \birdtrue \nicholsn
\profile4.wk1 (Lotus)

Ref. Num.	Reference Name	Corr. Nich. Elev.	Final Topo Elev.	Elev. Diff.	Nich. Chng.	Topo Chng.	Chng. Diff.
1	2	3	4	5	6	7	8
0	Weippe Prairie 3007		3020				
1	Heywood Meadows 3088	3066	3060	6		40	
2	inflect up	3124	3120	4	58	60	-2
3	inflect up	3213	3320	-107	89	200	-111
4	inf down	3377	3410	-33	164	90	74
5	Browns Creek Saddle 3396	3442	3445	-3	65	35	30
6	dip	3194	3195	-1	-248	-250	2
7	peak	3252	3235	17	58	40	18
8	dip	3209	3205	4	-43	-30	-13
9	peak	3227	3220	7	18	15	3
10	dip	3174	3185	-11	-52	-35	-17
11	peak	3253	3195	58	79	10	69
12	shallow dip (Small Prairie)	3146	3140	6	-107	-55	-52
13	Musselshell Prairie 3182	3169	3180	-11	24	40	-16
14	Musselshell Cr. Crossing	3174	3187	-13	5	7	-2
15	infl down	3411	3395	16	237	208	29
16	shallow peak	3423	3450	-27	12	55	-43
17	shallow dip 3424	3384	3424	-40	-39	-26	-13
18	peak 3646	3570	3646	-76	186	222	-36
19	dip	3502	3590	-88	-68	-56	-12
20	inflect down	3573	3640	-67	71	50	21
21	peak	3595	3690	-95	22	50	-28
22	small dip	3575	3660	-85	-20	-30	10

23	peak	3659	3725	-66	84	65	19
24	Siberia Creek	3453	3445	8	-206	-280	74
25	inflect down	3654	3680	-26	201	235	-34
26	peak	3755	3725	30	101	45	56
27	inflect up	3636	3680	-44	-119	-45	-74
28	Dutchman Creek	3518	3395	123	-118	-285	167
29	strange peak!	3570	3500	70	51	105	-54
30	Lolo Forks 3389	3443	3389	54	-126	-111	-15
31	inflect up	3746	3740	6	302	351	-49
32	inflect down 4251	4124	4251	-127	379	511	-132
33	Ridge Camp (Cold Spring)	4538	4871	-333	414	620	-206
34	inflect up	4743	4780	-37	205	-91	296
35	inflect down	4826	5000	-174	83	220	-137
36	peak	5100	5340	-240	274	340	-66
37	Camp Martin 5144	5031	5144	-113	-69	-196	127
38	Snowy Summit	5843	6040	-197	812	896	-84
39	inflect down	5798	6020	-222	-45	-20	-25
40	Beaver Dam Saddle 5302 (41.75mi)	5277	5302	-25	-521	-718	197
41	"inflect, Squirrel Mtn 5914"	5939	5914	25	662	612	50
42	Squirrel Mtn. 6257	6156	6235	-79	217	321	-104
43	dip (runs south)	5842	5840	2	-314	-395	81
44	peak	6145	6140	5	302	300	2
45	Little Weitas Creek 5412	5446	5385	61	-699	-755	56
46	peak (near Butte Camp)	5844	5805	39	398	420	-22
47	Green Saddle	5398	5420	-22	-446	-385	-61
48	Bowl Butte 6365	6175	6365	-190	777	945	-169
49	Deep Saddle 5027	5056	5027	29	-1119	-1338	219
50	Willow Ridge 6481	6247	6440	-193	1191	1413	-222
51	inflect down	5927	6180	-254	-321	-260	-61

52	Sherman Saddle	4732	4737	-5	-1194	-1443	249
53	inflect down 5725	5578	5725	-147	846	988	-142
54	inflect down 6090	6067	6090	-23	489	365	124
55	peak 6230	6195	6230	-36	128	140	-13
56	dip	6132	6130	2	-63	-100	38
57	Ridge NE of Sherman Peak	6316	6320	-4	184	190	-6
58	inflect up	6010	6020	-11	-306	-300	-6
59	No-See-Um Meadows 5890	5891	5890	1	-119	-130	11
60	sharp peak	6331	6130	201	440	240	200
61	inflect up	5997	6010	-13	-334	-120	-214
62	saddle 5894	5892	5894	-2	-105	-116	12
63	inflect up	5980	6050	-70	88	156	-68
64	sharp peak	6122	6130	-9	142	80	62
65	Saddle	5876	5860	16	-245	-270	25
66	Bald Mountain	6161	6300	-139	285	440	-156
67	saddle 5782	5782	5782	0	-379	-518	139
68	inflect down 6066	6051	6066	-15	268	284	-16
69	inflect down	6212	6220	-8	162	154	8
70	small peak 6276	6247	6276	-29	35	56	-21
71	small dip	6189	6180	9	-58	-96	38
72	inflect level	6536	6500	36	346	320	26
73	inflect up	6531	6500	31	-5	0	-5
74	inflect level 6555	6569	6555	14	38	55	-17
75	inflect down 6554	6563	6554	9	-6	-1	-5
76	Saddle	6358	6340	18	-205	-214	9
77	Castle Rock 6592	6537	6592	-55	180	252	-73
78	saddle	6342	6370	-28	-195	-222	27
79	Smoking Place 6574	6517	6574	-57	175	204	-29
80	inflect up	6349	6410	-62	-168	-164	-4

81	Indian Grave Camp	6244	6280	-36	-105	-130	26
82	small peak	6332	6370	-38	88	90	-2
83	Sinque Hole	6035	5980	55	-297	-390	93
84	peak 6279	6248	6279	-32	213	299	-87
85	Saddle	5924	5870	54	-324	-409	85
86	peak 6099	6090	6099	-9	166	229	-63
87	inflect down	5895	5860	35	-195	-239	44
88	inflect up 5634	5611	5634	-23	-284	-226	-58
89	Serpent Creek (Snow Bridge) Gulch	4543	4570	-28	-1069	-1064	-5
89	Serpent Creek (Snow Bridge) Gulch	4543	4570	-28	0	0	0
90	inflect down	6234	6240	-6	1692	1670	22
91	Moccasin Peak (at saddle)	6410	6390	20	176	150	26
92	Howard Camp (Meadow)	6067	6090	-23	-343	-300	-43
93	peak 6308	6309	6308	1	242	218	24
94	saddle between	6231	6230	1	-78	-78	0
95	peak 6635	6595	6635	-40	364	405	-41
96	saddle	6487	6490	-3	-108	-145	37
97	peak 6658	6599	6658	-60	112	168	-57
98	saddle 6441	6445	6441	4	-154	-217	64
99	inflect down	6648	6620	28	203	179	24
100	peak 6773	6700	6673	27	52	53	-1
101	Moon Saddle	6125	6100	25	-576	-573	-3
102	Leaning Tree Camp	6176	6140	36	51	40	11
103	peak 6575	6498	6520	-22	323	380	-58
104	dip	6450	6420	30	-48	-100	52
105	peak 6530	6502	6530	-28	52	110	-58
106	dip	6446	6460	-15	-57	-70	14
107	inflect down	6742	6750	-9	296	290	6
108	inflect level	7001	7005	-4	259	255	4

109	Indian P.O. Peak 7033	7000	6990	10	-1	-15	14
110	dip	6809	6810	-1	-191	-180	-11
111	peak 7004	6969	6960	9	159	150	9
112	dip	6788	6780	8	-181	-180	-1
113	peak	6907	6890	17	119	110	9
114	dip 6782	6777	6782	-5	-130	-108	-22
115	peak 6932	6916	6932	-16	139	150	-11
116	inflect up	6635	6600	35	-281	-332	51
117	inflect down	6425	6400	25	-210	-200	-10
118	inflect up	6116	6090	26	-309	-310	1
119	dip	6088	6090	-2	-28	0	-28
120	peak	6210	6250	-40	122	160	-38
121	dip	6154	6170	-16	-56	-80	24
122	Spring Mtn 6306	6235	6306	-71	81	136	-55
123	inflect up	6100	6100	0	-135	-206	71
124	saddle	5872	5860	12	-228	-240	12
125	inflect level 6034	6018	6034	-16	146	174	-28
126	inflect up	6005	5980	25	-13	-54	41
127	peak 6252	6172	6252	-80	167	272	-105
128	Cayuse Junction 5342	5350	5342	8	-822	-910	88
129	inflect up	5960	6050	-90	610	708	-98
130	inflect down	6764	6810	-46	804	760	44
131	The Chief (Mt. Marcy)	6884	6890	-6	120	80	40
132	saddle	6426	6430	-4	-458	-460	2
133	inflect down	6587	6650	-63	161	220	-59
134	peak 6879	6738	6800	-62	151	150	1
135	Saddle	6630	6660	-31	-109	-140	32
136	peak 6934	6781	6880	-99	152	220	-68
137	slight dip	6743	6770	-28	-39	-110	71

138	slight peak 6882	6798	6835	-38	55	65	-10
139	Saddle	6740	6740	0	-58	-95	38
140	peak	6792	6800	-8	52	60	-8
141	Saddle	6635	6620	15	-158	-180	22
142	sharp peak 6888	6756	6820	-64	121	200	-79
143	inflect up (at saddle)	6343	6350	-7	-413	-470	57
144	inflect level	6137	6140	-3	-205	-210	5
145	inflect down	6135	6140	-6	-3	0	-3
146	Papoose Saddle	5671	5647	24	-464	-493	30
147	inflect level 6130	6088	6130	-42	417	483	-66
148	inflect down	6086	6125	-39	-2	-5	3
149	"Saddle 5872, Powell Jct. Road"	5894	5872	22	-191	-253	62
150	inflect level	5971	5970	1	77	98	-22
151	inflect down	5956	5930	26	-15	-40	25
152	Saddle 5466	5452	5466	-14	-504	-464	-40
153	peak	5610	5590	20	158	124	34
154	dip	5560	5500	60	-51	-90	39
155	inflect down	5778	5790	-12	218	290	-72
156	inflect up	5875	5860	15	98	70	28
157	Rocky Point 6280	6275	6280	-5	400	420	-20
158	inflect up	5930	5940	-10	-345	-340	-5
159	inflect level	5839	5840	-1	-91	-100	9
160	curve down 5785	5814	5785	29	-25	-55	30
161	Crooked Fork	3929	3970	-41	-1885	-1815	-70
162	inflect up	4845	4830	15	916	860	56
163	inflect down	5371	5370	1	526	540	-14
164	inflect up	5502	5500	2	131	130	1
165	inflect level	5642	5645	-3	140	145	-5
166	inflect down 5661	5642	5640	2	0	-5	5

167	Pack Creek	5163	5140	23	-479	-500	21
168	L&C Glade Creek Camp	5174	5185	-11	11	45	-34
169	Pack Creek (N5292)	5240	5199	41	66	14	52
170	Lolo Pass (circa 1912)	5260	5254	6	20	55	-35
171	dip (West Fork Lolo Cr.)	5211	5190	21	-49	-64	15
172	inflect down	5393	5410	-17	182	220	-38
173	Wagon Mountain	5554	5570	-16	161	160	1
174	inflect down	5327	5340	-13	-228	-230	2
175	inflect down	4962	5160	-198	-365	-180	-185
176	West Fork Lolo Creek	4253	4241	12	-709	-919	211
177	peak	4495	4600	-105	242	359	-117
178	inflect up	4258	4235	23	-237	-365	128
179	inflect level	4128	4160	-32	-129	-75	-54
180	Lolo Hot Springs	4129	4150	-21	1	-10	11
181	inflect down	4280	4300	-20	150	150	0
182	peak	4310	4330	-20	30	30	0
183	Granite Creek	4121	4140	-19	-189	-190	1
184	L&C Camp 09/12/05	4211	4230	-19	90	90	0
185	peak	4253	4270	-17	42	40	2
186	2 Fords of Lolo Creek	4076	4045	31	-177	-225	48
187	inflect up steeply 4034	4077	4040	37	1	-5	6
188	inflect down	4889	4900	-11	812	860	-48
189	inflect level	5131	5160	-29	242	260	-18
190	inflect up	5143	5180	-37	12	20	-8
191	peak	5224	5240	-16	81	60	21
192	dip	4795	4800	-5	-429	-440	11
193	peak	4836	4840	-4	41	40	1
194	inflect down	4490	4500	-10	-347	-340	-7
195	Howard Cr. 3851 (Mullans Camp)	4009	3851	158	-481	-649	168

196	peak	3942	3945	-3	-67	94	-161
197	dip (creek from North)	3872	3875	-3	-70	-70	0
198	peak	3932	3935	-3	60	60	0
199	Hungry Creek (inflect up)	3832	3835	-3	-100	-100	0
200	Grave Creek	3792	3788	4	-40	-47	7
201	peak	4052	4050	2	260	262	-2
202	dip	3942	3945	-3	-110	-105	-5
203	peak	4052	4055	-3	110	110	0
204	dip	4012	4015	-3	-40	-40	0
205	inflect level	4102	4105	-3	90	90	0
206	inflect down	4102	4105	-3	0	0	0
207	Clark Creek	3942	3945	-3	-160	-160	0
208	peak	4232	4250	-18	290	305	-15
209	Potato Gulch	4092	4095	-3	-140	-155	15
210	peak	4222	4225	-3	130	130	0
211	Sheldon Creek	4062	4065	-3	-160	-160	0
212	peak	4142	4175	-33	80	110	-30
213	Smith Creek	4102	4105	-3	-40	-70	30
214	peak	4172	4175	-3	70	70	0
215	Bear Creek	3766	3760	6	-406	-415	9
216	peak	4015	4100	-85	249	340	-92
217	Camp Creek	3844	3840	4	-171	-260	89
218	inflect up	3942	3910	32	99	70	29
219	peak	4011	3980	31	69	70	-2
220	dip	3920	3920	0	-91	-60	-31
221	peak	3989	4020	-31	69	100	-31
222	Woodman Creek 3542	3584	3580	4	-406	-440	35
223	L&C Camp? 11/11/05	3502	3460	42	-82	-120	38
224	inflect down	3392	3390	2	-110	-70	-40

225	inflect up 3356	3299	3356	-57	-94	-34	-60
226	Elev. Ref.	3274	3230	44	-25	-126	101
227	L&C Camp? 6/30/06	3249	3200	49	-25	-30	5
228	Bitter Root River	3160	3155	5	-89	-45	-44

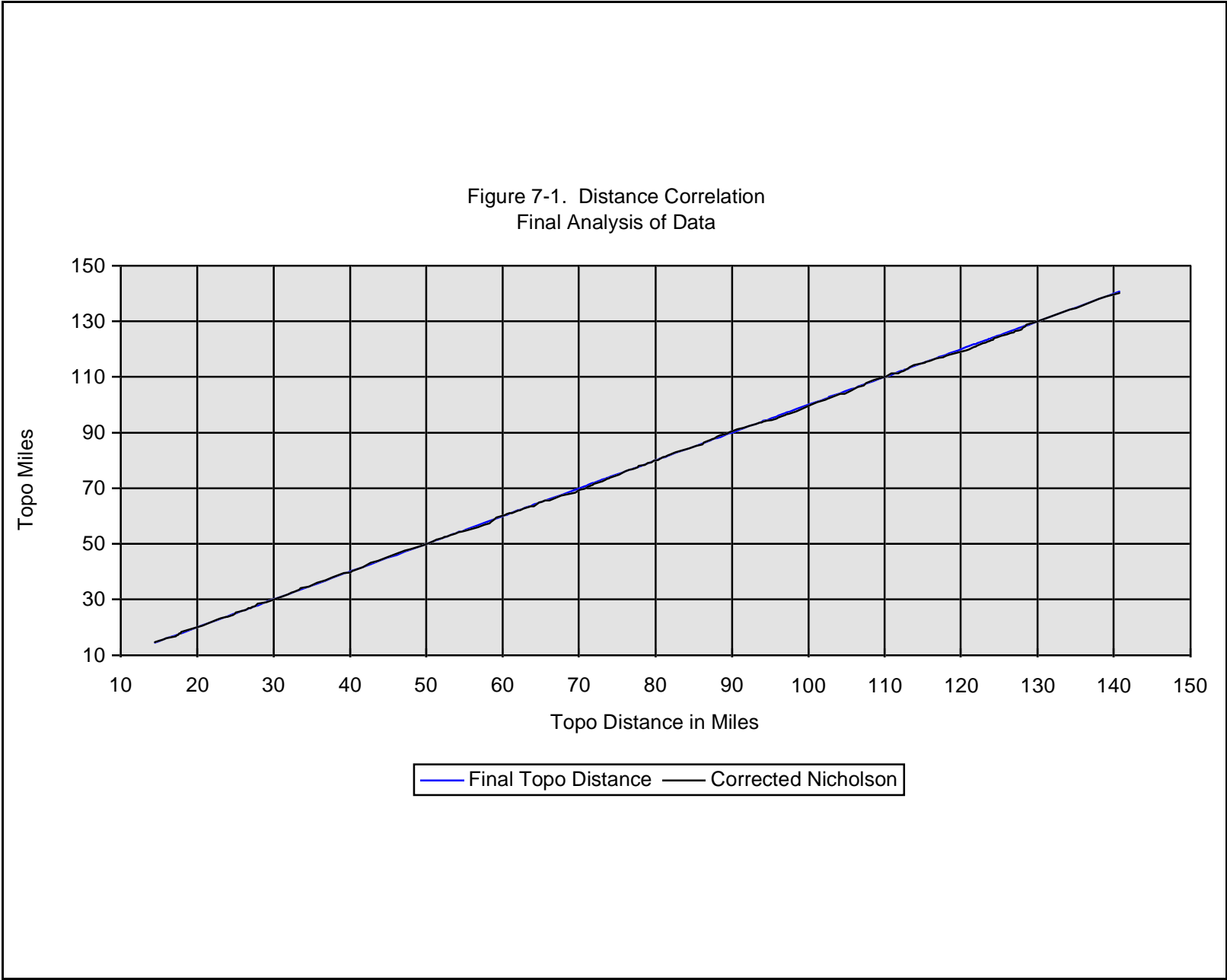


Figure 7-1

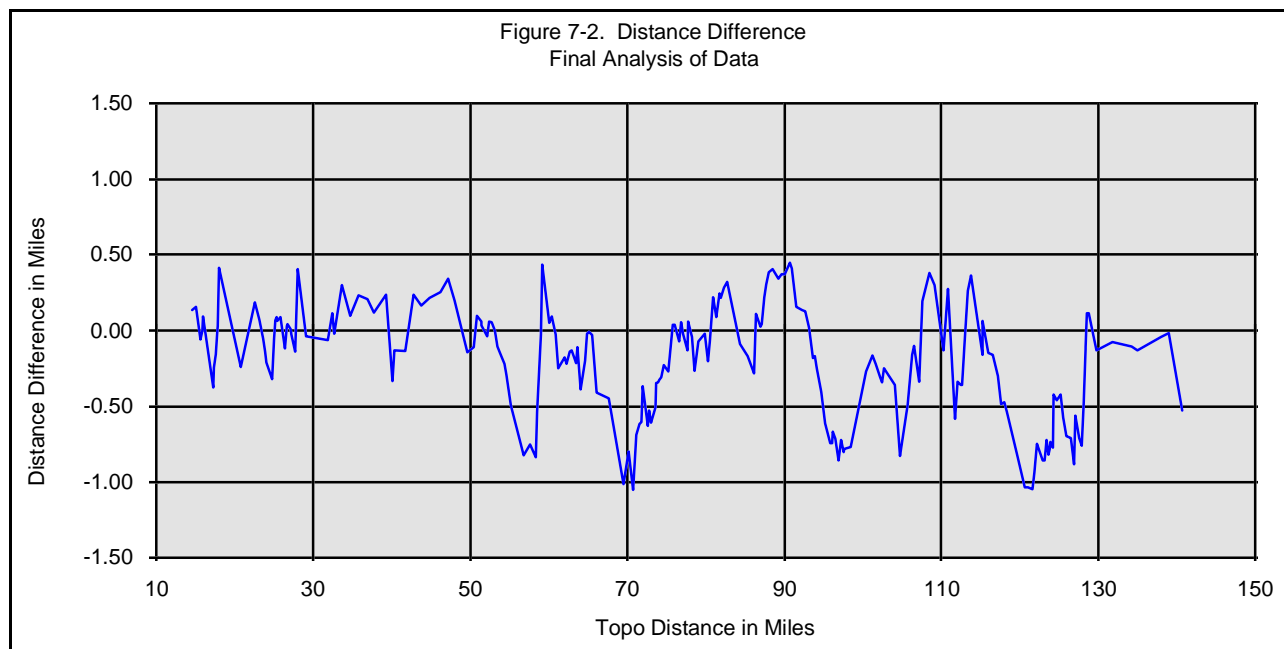


Figure 7-2

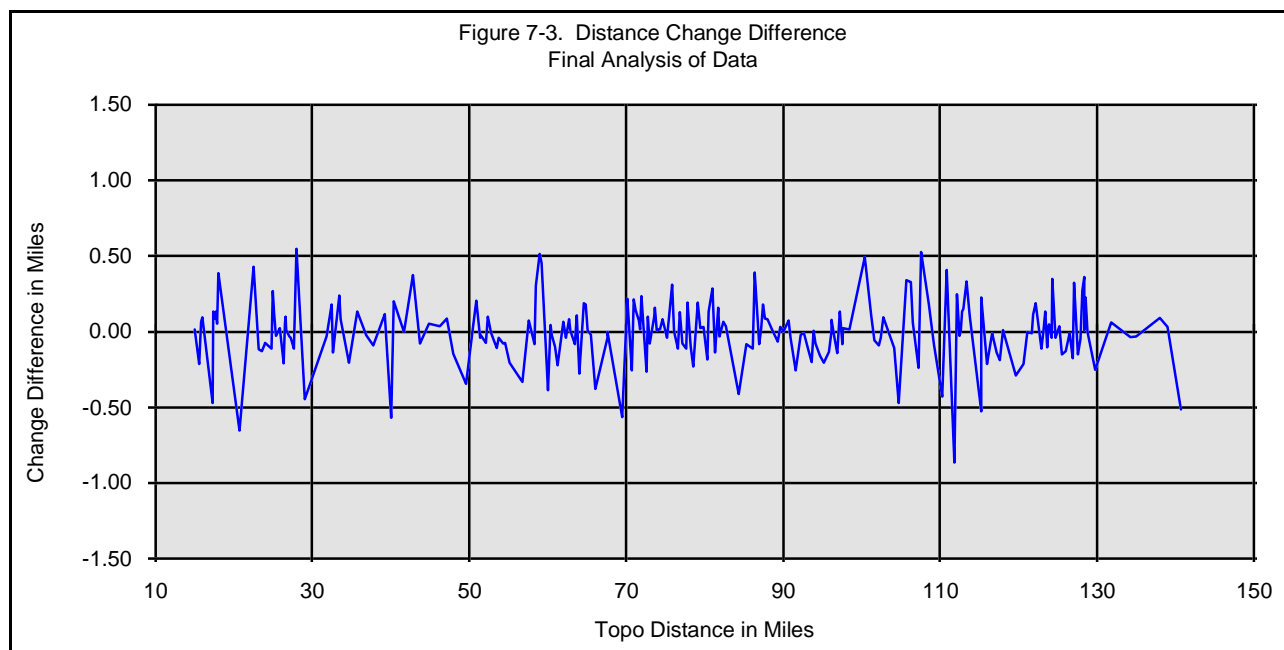


Figure 7-3

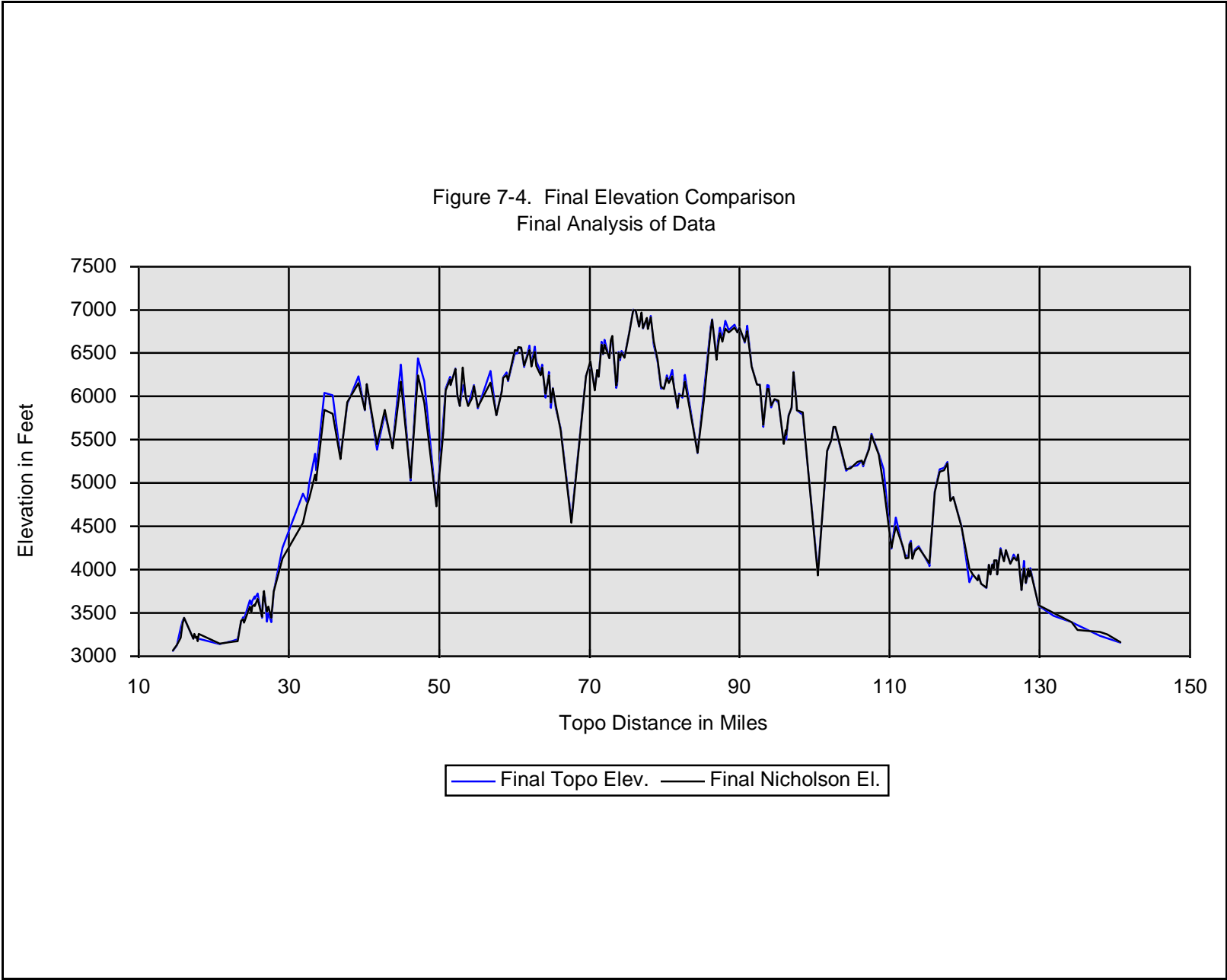


Figure 7-4

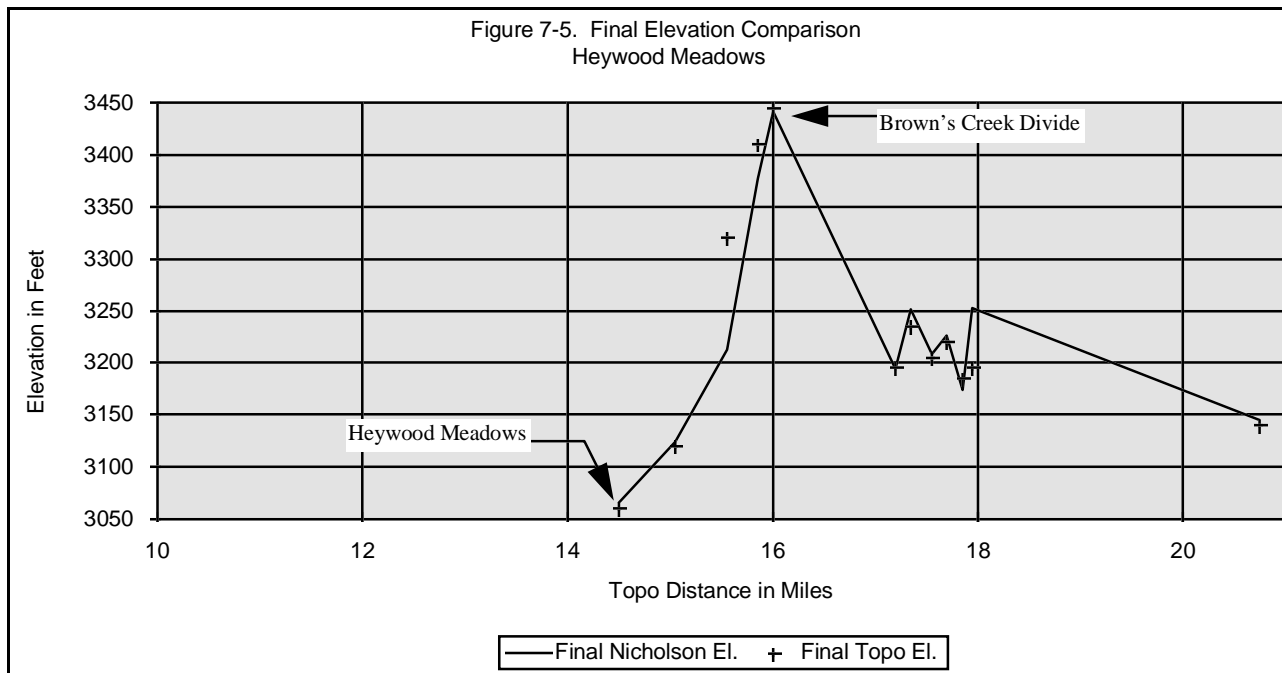


Figure 7-5

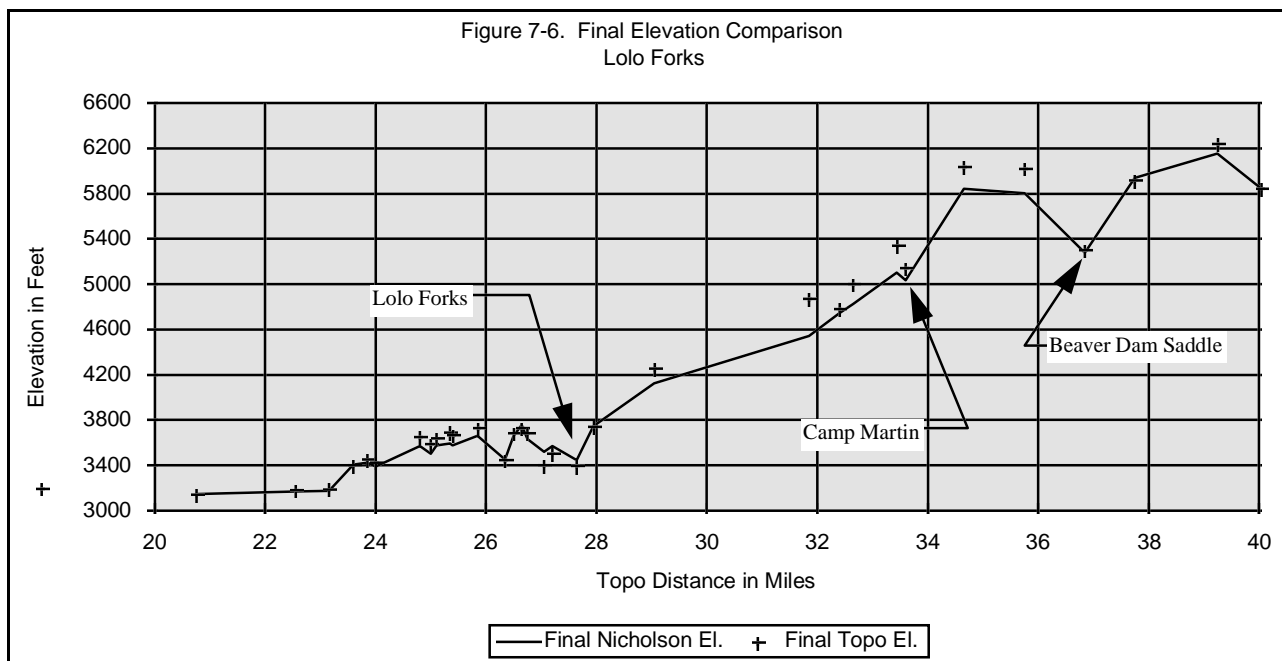


Figure 7-6

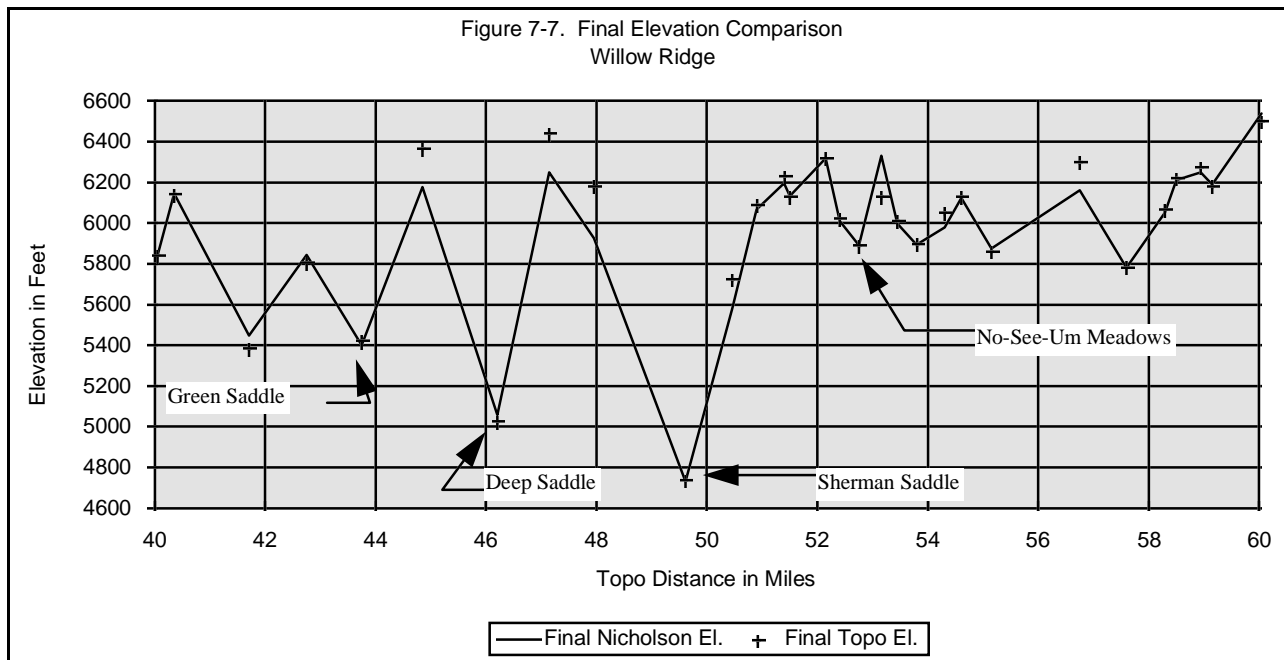


Figure 7-7

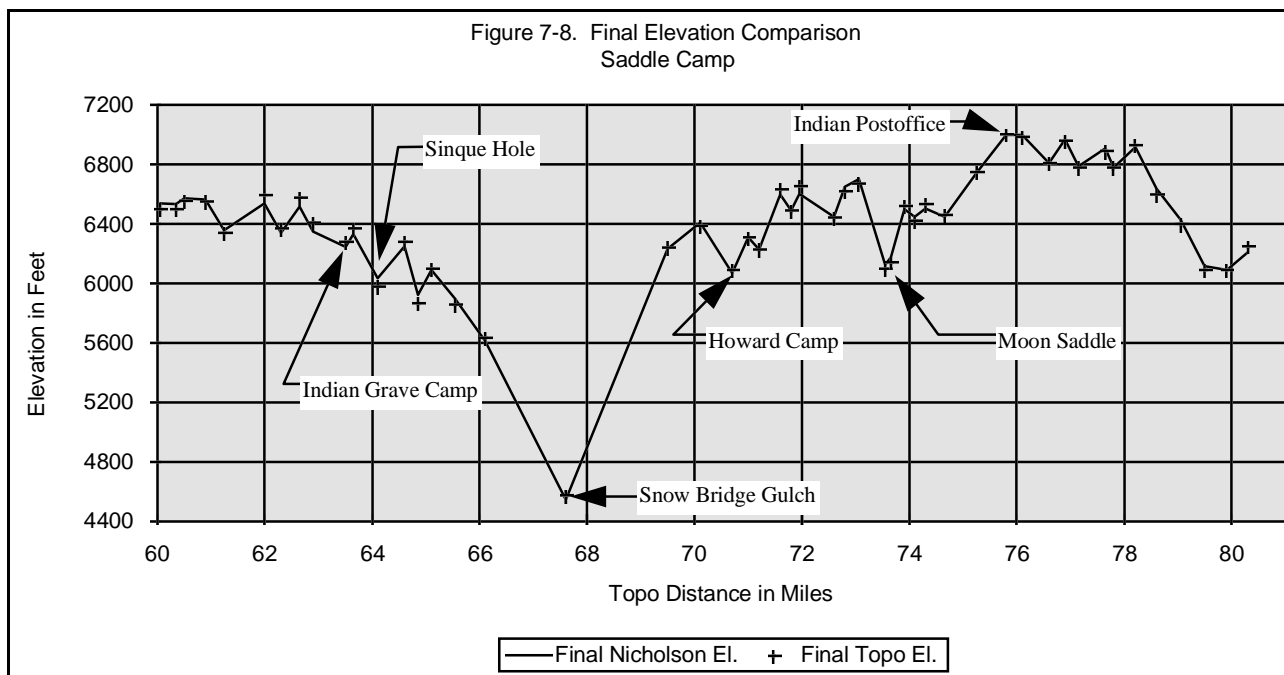


Figure 7-8

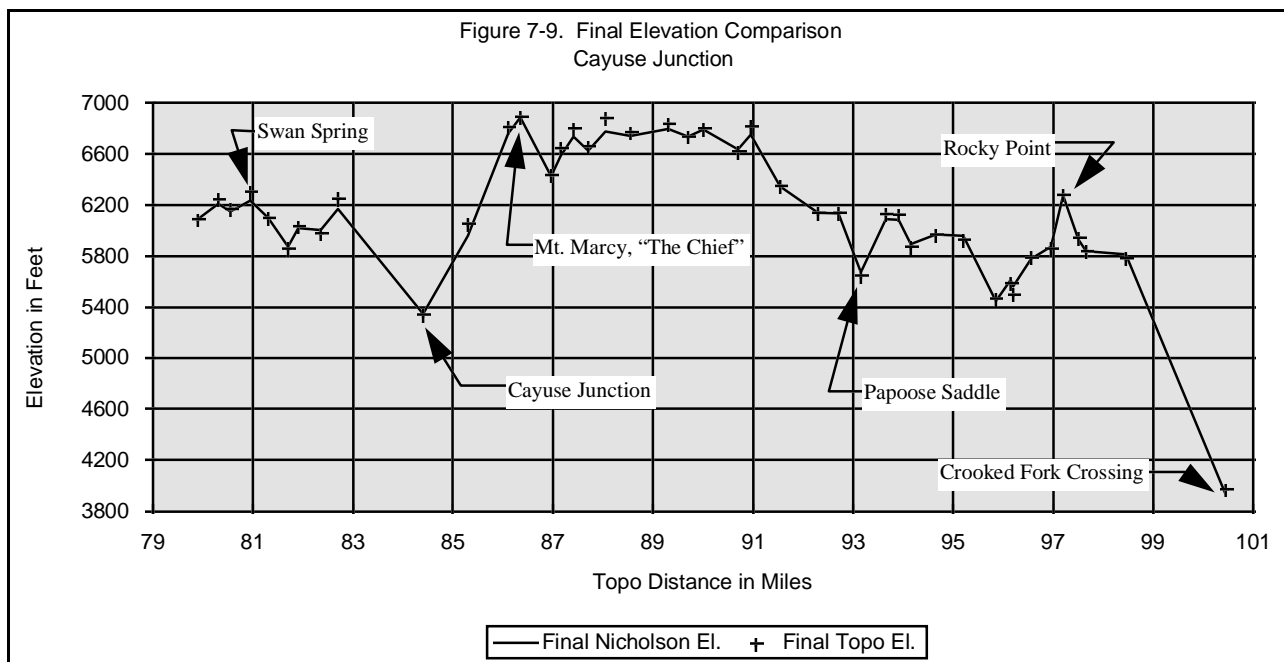


Figure 7-9

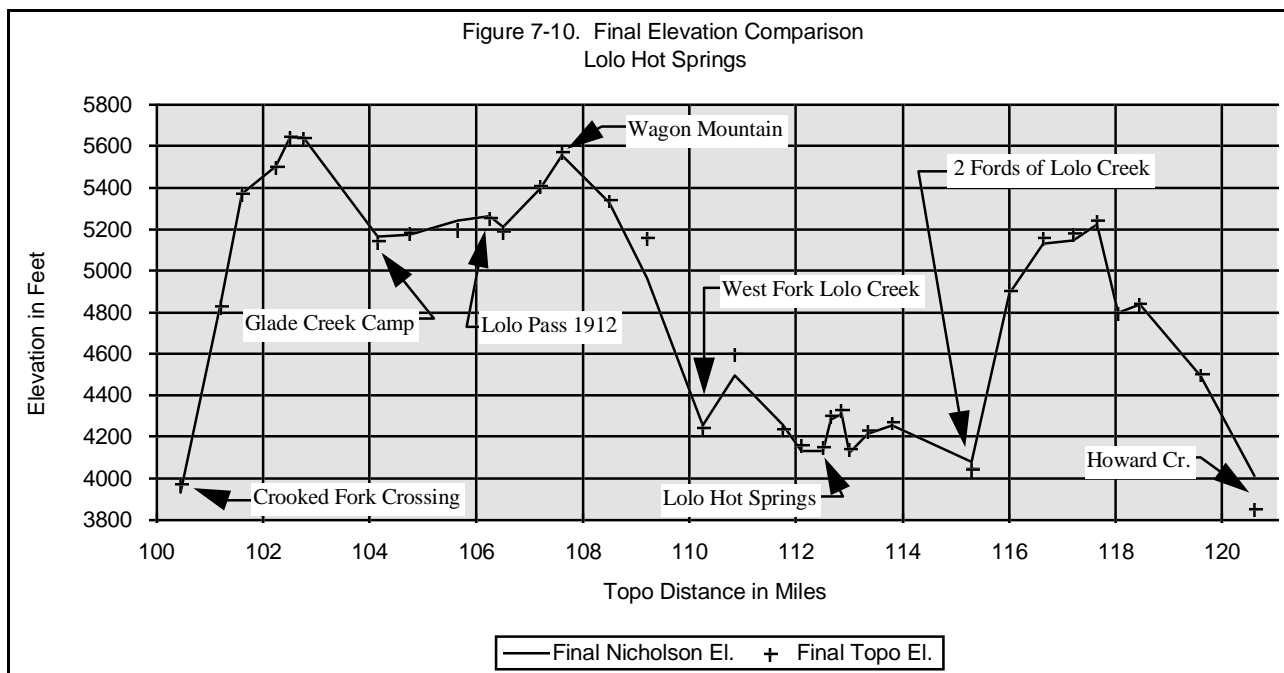


Figure 7-10

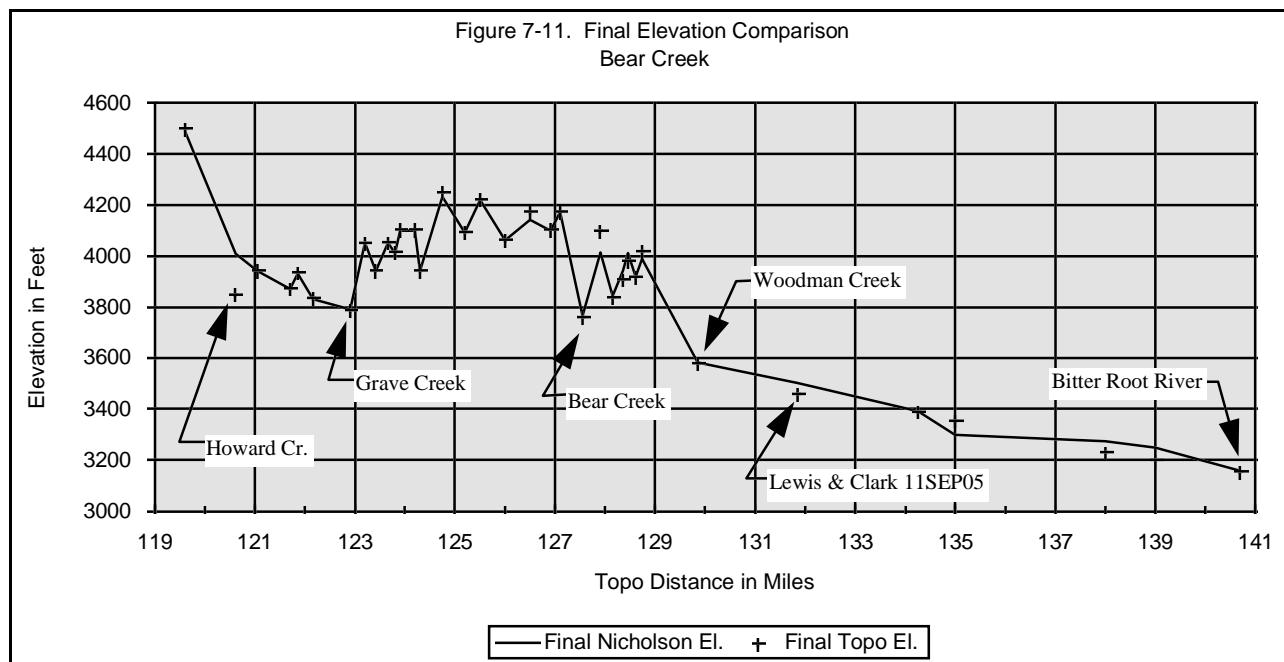


Figure 7-11

TABLE 7-3.

This table presents the distance and elevation data of Tables 7-1 and 7-2 in a format that is more suitable for comparison of the results. In particular, the distances start with zero at reference #1 and the corresponding Nicholson and Topo values are side-by-side.

TABLE 7-3. Final Distance/Elevation Results					
e:\steve \trails \lolotral \research \birdtrue \nicholsn \profile4.wk1 (Lotus)					
Ref. Num.	Reference Name	Final Nich. Dist.	Final Topo Dist.	Final Nich. Elev.	Final Topo Elev.
1	2	3	4	5	6
0	Weippe Prairie 3007		-2.40		3020
1	Heywood Meadows 3088	0.00	0.00	3066	3060
2	inflect up	0.57	0.55	3124	3120
3	inflect up	0.85	1.05	3213	3320
4	inf down	1.21	1.35	3377	3410
5	Browns Creek Saddle 3396	1.46	1.50	3442	3445
6	dip	2.19	2.70	3194	3195
7	peak	2.47	2.85	3252	3235
8	dip	2.75	3.05	3209	3205
9	peak	3.04	3.20	3227	3220
10	dip	3.24	3.35	3174	3185
11	peak	3.72	3.45	3253	3195
12	shallow dip (Small Prairie)	5.87	6.25	3146	3140
13	Musselshell Prairie 3182	8.10	8.05	3169	3180
14	Musselshell Cr. Crossing	8.58	8.65	3174	3187
15	infl down	8.91	9.10	3411	3395
16	shallow peak	9.07	9.35	3423	3450
17	shallow dip 3424	9.15	9.50	3384	3424
18	peak 3646	9.84	10.30	3570	3646

19	dip	10.31	10.50	3502	3590
20	inflect down	10.53	10.60	3573	3640
21	peak	10.80	10.85	3595	3690
22	small dip	10.82	10.90	3575	3660
23	peak	11.30	11.35	3659	3725
24	Siberia Creek	11.59	11.85	3453	3445
25	inflect down	11.79	12.00	3654	3680
26	peak	12.04	12.15	3755	3725
27	inflect up	12.15	12.25	3636	3680
28	Dutchman Creek	12.42	12.55	3518	3395
29	strange peak!	12.53	12.70	3570	3500
30	Lolo Forks 3389	12.87	13.15	3443	3389
31	inflect up	13.72	13.45	3746	3740
32	inflect down 4251	14.37	14.55	4124	4251
33	Ridge Camp	17.15	17.35	4538	4871
34	inflect up	17.88	17.90	4743	4780
35	inflect down	17.99	18.15	4826	5000
36	peak	19.03	18.95	5100	5340
37	Camp Martin 5144	19.26	19.10	5031	5144
38	Snowy Summit	20.11	20.15	5843	6040
39	inflect down	21.34	21.25	5798	6020
40	Beaver Dam Saddle 5302 (41.75mi)	22.42	22.35	5277	5302
41	"inflect, Squirrel Mtn 5914"	23.23	23.25	5939	5914
42	Squirrel Mtn. 6257	24.85	24.75	6156	6235
43	dip (runs south)	25.08	25.55	5842	5840
44	peak	25.58	25.85	6145	6140
45	Little Weitas Creek 5412	26.92	27.20	5446	5385
46	peak	28.35	28.25	5844	5805
47	Green Saddle	29.27	29.25	5398	5420

48	Bowl Butte 6365	30.43	30.35	6175	6365
49	Deep Saddle 5027	31.81	31.70	5056	5027
50	Willow Ridge 6500	32.85	32.65	6247	6440
51	inflect down 5801	33.51	33.45	5927	6180
52	Sherman Saddle	34.82	35.10	4732	4737
53	inflect down 5725	35.70	35.95	5578	5725
54	inflect down 6090	36.36	36.40	6067	6090
55	peak 6230	36.82	36.90	6195	6230
56	dip	36.90	37.00	6132	6130
57	Ridge NE of Sherman Peak	37.47	37.65	6316	6320
58	inflect up	37.82	37.90	6010	6020
59	No-See-Um Meadows 5890	38.17	38.25	5891	5890
60	sharp peak	38.51	38.65	6331	6130
61	inflect up	38.71	38.95	5997	6010
62	saddle 5894	39.01	39.30	5892	5894
63	inflect up	39.44	39.80	5980	6050
64	sharp peak	39.67	40.10	6122	6130
65	Saddle	40.01	40.65	5876	5860
66	Bald Mountain	41.29	42.25	6161	6300
67	saddle 5782	42.21	43.10	5782	5782
68	inflect down	42.83	43.80	6051	6066
69	inflect down 6066	43.33	44.00	6212	6220
70	small peak 6276	44.29	44.45	6247	6276
71	small dip	44.95	44.65	6189	6180
72	inflect level	45.46	45.55	6536	6500
73	inflect up	45.81	45.85	6531	6500
74	inflect level 6555	45.94	46.00	6569	6555
75	inflect down 6554	46.24	46.40	6563	6554
76	Saddle	46.37	46.75	6358	6340

77	Castle Rock 6592	47.18	47.50	6537	6592
78	saddle	47.44	47.80	6342	6370
79	Smoking Place 6574	47.87	48.15	6517	6574
80	inflect	48.13	48.40	6349	6410
81	Indian Grave Camp	48.64	49.00	6244	6280
82	small peak	48.90	49.15	6332	6370
83	Sinque Hole	49.07	49.60	6035	5980
84	peak 6279	49.76	50.10	6248	6279
85	Saddle	50.19	50.35	5924	5870
86	peak 6099	50.45	50.60	6090	6099
87	inflect down	50.88	51.05	5895	5860
88	inflect up 5634	51.05	51.60	5611	5634
89	Serpent Creek (Snow Bridge)	52.51	53.10	4543	4570
89	Serpent Creek (Snow Bridge)	52.51	53.10	4543	4570
90	inflect down	53.85	55.00	6234	6240
91	Moccasin Peak (at saddle)	54.66	55.60	6410	6390
92	Howard Camp (Saddle)	55.01	56.20	6067	6090
93	peak 6308	55.52	56.50	6309	6308
94	saddle between	55.87	56.70	6231	6230
95	peak 6635	56.34	57.10	6595	6635
96	saddle	56.56	57.30	6487	6490
97	peak 6658	56.94	57.45	6599	6658
98	saddle 6441	57.33	58.10	6445	6441
99	inflect down	57.63	58.30	6648	6620
100	peak 6773	57.80	58.55	6700	6673
101	Moon Saddle	58.41	59.05	6125	6100
102	Leaning Tree Camp	58.66	59.15	6176	6140
103	peak 6575	58.92	59.40	6498	6520
104	dip	59.14	59.60	6450	6420

105	peak 6530	59.35	59.80	6502	6530
106	dip	59.78	60.15	6446	6460
107	inflect down	60.34	60.75	6742	6750
108	inflect level	61.20	61.30	7001	7005
109	Indian P.O. Peak 7033	61.50	61.60	7000	6990
110	dip	61.89	62.10	6809	6810
111	peak 7004	62.32	62.40	6969	6960
112	dip	62.49	62.65	6788	6780
113	peak	62.88	63.15	6907	6890
114	dip 6782	63.22	63.30	6777	6782
115	peak 6932	63.52	63.70	6916	6932
116	inflect up	63.69	64.10	6635	6600
117	inflect down	64.34	64.55	6425	6400
118	inflect up	64.81	65.00	6116	6090
119	dip	65.24	65.40	6088	6090
120	peak	65.46	65.80	6210	6250
121	dip	65.84	66.05	6154	6170
122	Spring Mtn 6306	66.53	66.45	6235	6306
123	inflect up	66.75	66.80	6100	6100
124	saddle	67.31	67.20	5872	5860
125	inflect level 6034	67.48	67.40	6018	6034
126	inflect up	67.99	67.85	6005	5980
127	peak 6252	68.38	68.20	6172	6252
128	Cayuse Junction 5342	69.67	69.90	5350	5342
129	inflect up	70.49	70.80	5960	6050
130	inflect down	71.18	71.60	6764	6810
131	The Chief (Mt. Marcy)	71.82	71.85	6884	6890
132	saddle	72.34	72.45	6426	6430
133	inflect down	72.55	72.65	6587	6650

134	peak 6879	72.98	72.90	6738	6800
135	Saddle	73.37	73.20	6630	6660
136	peak 6934	73.80	73.55	6781	6880
137	slight dip 6723	74.32	74.05	6743	6770
138	slight peak 6882	75.00	74.80	6798	6835
139	Saddle	75.43	75.20	6740	6740
140	peak	75.73	75.50	6792	6800
141	Saddle	76.51	76.20	6635	6620
142	sharp peak 6888	76.72	76.45	6756	6820
143	inflect up (at saddle)	77.07	77.05	6343	6350
144	inflect level	77.80	77.80	6137	6140
145	inflect down	78.19	78.20	6135	6140
146	Papoose Saddle	78.53	78.65	5671	5647
147	inflect level 6130	78.83	79.15	6088	6130
148	inflect down 6125	79.09	79.40	6086	6125
149	"Saddle 5872, Powell Jct. Road"	79.26	79.65	5894	5872
150	inflect level	79.60	80.15	5971	5970
151	inflect down	79.95	80.70	5956	5930
152	Saddle 5466	80.46	81.35	5452	5466
153	peak	80.77	81.65	5610	5590
154	dip	80.89	81.70	5560	5500
155	inflect down	81.20	82.05	5778	5790
156	inflect up	81.45	82.45	5875	5860
157	Rocky Point 6280	81.84	82.70	6275	6280
158	inflect up	82.06	83.00	5930	5940
159	inflect level	82.23	83.15	5839	5840
160	curve down 5785	83.04	83.95	5814	5785
161	Crooked Fork	85.54	85.95	3929	3970
162	inflect up	86.40	86.70	4845	4830

163	inflect down	86.74	87.10	5371	5370
164	inflect up	87.30	87.75	5502	5500
165	inflect level	87.52	88.00	5642	5645
166	inflect down 5661	87.86	88.25	5642	5640
167	Pack Creek	89.15	89.65	5163	5140
168	L&C Glade Creek Camp	89.28	90.25	5174	5185
169	Cross Pack Creek	90.52	91.15	5240	5199
170	Lolo Pass (circa 1912)	91.45	91.75	5260	5254
171	dip (West Fork Lolo Cr.)	91.76	92.00	5211	5190
172	inflect down	92.23	92.70	5393	5410
173	Wagon Mountain	93.16	93.10	5554	5570
174	inflect down	94.24	94.00	5327	5340
175	inflect down	94.86	94.70	4962	5160
176	West Fork Lolo Creek	95.48	95.75	4253	4241
177	peak	96.49	96.35	4495	4600
178	inflect up	96.53	97.25	4258	4235
179	inflect level	97.13	97.60	4128	4160
180	Lolo Hot Springs	97.50	98.00	4129	4150
181	inflect down	97.65	98.15	4280	4300
182	peak	97.99	98.35	4310	4330
183	dip	98.29	98.50	4121	4140
184	L&C Camp 09/12/05	98.97	98.85		
185	peak	99.53	99.30	4253	4270
186	2 Fords of Lolo Creek	100.50	100.80	4076	4045
187	inflect up steeply 4034	100.73	100.80	4077	4040
188	inflect down	101.21	101.50	4889	4900
189	inflect level	101.85	102.15	5131	5160
190	inflect up	102.26	102.70	5143	5180
191	peak	102.53	103.15	5224	5240

192	dip	102.94	103.55	4795	4800
193	peak	103.28	103.95	4836	4840
194	inflect down	104.14	105.10	4490	4500
195	Howard Cr. 3851 (Mullans Camp)	104.93	106.10	4009	3851
196	peak	105.38	106.55	3942	3945
197	dip (creek from North)	106.01	107.20	3872	3875
198	peak	106.28	107.35	3932	3935
199	Hungry Creek (inflect up)	106.76	107.65	3832	3835
200	Grave Creek	107.40	108.40	3792	3788
201	peak	107.70	108.70	4052	4050
202	dip	108.04	108.90	3942	3945
203	peak	108.19	109.15	4052	4055
204	dip	108.38	109.30	4012	4015
205	inflect level	108.53	109.40	4102	4105
206	inflect down	108.79	109.70	4102	4105
207	Clark Creek	109.24	109.80	3942	3945
208	peak	109.65	110.25	4232	4250
209	Potato Gulch	110.14	110.70	4092	4095
210	peak	110.29	111.00	4222	4225
211	Sheldon Creek	110.66	111.50	4062	4065
212	peak	111.15	112.00	4142	4175
213	Smith Creek	111.38	112.40	4102	4105
214	peak	111.90	112.60	4172	4175
215	Bear Creek	112.20	113.05	3766	3760
216	peak	112.50	113.40	4015	4100
217	Camp Creek	113.03	113.65	3844	3840
218	inflect up	113.59	113.85	3942	3910
219	peak	113.70	113.95	4011	3980
220	dip	114.08	114.10	3920	3920

221	peak	114.23	114.25	3989	4020
222	Woodman Creek 3542	115.08	115.35	3584	3580
223	L&C Camp? 11/11/05	117.14	117.35	3502	3460
224	inflect down	119.51	119.75	3392	3390
225	inflect up 3356	120.23	120.50	3299	3356
226	Elev. Ref.	123.32	123.50	3274	3230
227	L&C Camp? 6/30/06	124.35	124.50	3249	3200
228	Bitter Root River	125.53	126.20	3160	3155

8. LISTS

Table 8-1. Nicholson Place Name List			
Ref. Num.	Reference Name	Nicholson Distance	Nicholson Elevation
1	2	3	4
1	Oyipe Prairie	0.00	3228
13	Muscle Shell Prairie	10.00	3367
14	E. Branch Muscle Shell	10.60	3367
24	Creek (Runs South)	15.15	3620
30	Lo-Lo (Collins) Cr.	18.00	3600
33	Ridge Camp	30.00	4659
37	The Neck	32.75	5140
38	Mt. Truax	33.85	5944
41	Squirrel Mtn (Muscoemax)	37.90	6015
43	runs south	40.30	5900
45	Huston Creek (runs N.)	43.95	5490
48	Mt. Juliet	48.50	6532
50	Mt. Romeo	51.65	6616
53	Broken Rock Point	55.35	5960
59	Prairie Gulch (runs S.)	58.55	6120
66	Meadow Mtn	62.60	6528
77	Castle Rock	69.40	6770
89	Snow Bridge	75.60	5160
102	Leaning Tree	82.75	6000
122	"L&C Camp, peak"	91.90	6090
125	Sharp Backbone	93.00	5890
128	Lake Templin	95.55	5272
131	Mt. Marcy	98.05	6845

146	Independence Camp	105.85	6220
157	Mt. Simpson	109.70	6552
161	Kooskooskee River	114.00	4229
167	Glade Creek	119.00	5219
168	L&C Camp 9/13/05	119.60	5230
169	Glade Creek Crossing	120.40	5292
170	"Divide, Bitter Rts."	121.00	5310
176	Ford of LouLou Creek	123.60	4290
180	Hot Spring	126.00	4160
184	L&C Camp 09/12/05	127.95	4230
186	"2 Fords, LouLou Cr."	130.00	4100
195	Mullans Camp	135.90	4016
197	Creek from North	137.35	4040
199	Creek from North	138.35	4000
207	Creek from North	141.65	4110
211	Creek from North	143.55	4230
215	Large Creek from North	145.60	4030
217	Creek from North	146.70	4110
222	Creek from North	150.00	3860
223	"L&C Camp, 11/11/05"	152.00	3790
227	L&C Camp 6/30/06	159.00	3570
228	Bitter Root River	160.15	3490

TABLE 8-2. LEWIS AND CLARK CAMPS - As Reported by George Nicholson in 1866							
Ref. No.	Name	Date	Nichol Miles	Nichol Elev.	Corr Elev	Topo Elev	Ref Miles
1	2	3	4	5	6	7	8
1	Oyipe Prairie	June 10-14, 1806 June 21-23, 1806	0.00	3328 *	3007 *	3007	60.7
13	Muscle Shell Prairie	Lewis Sept. 21, 1805	10.00	3367 *	3187 *	3180	70.7
30	Lo-Lo Cr.	L&C June 15, 1806 Clark Sept. 19, 1805	18.00	3600	3420 *	3389	78.7
59	Prairie Gulch	Lewis Sept. 18, 1805	58.55	6120	5885 *	5890	119.3
66	Meadow Mt.	L&C June 26, 1806	62.60	6528	6183	6190	123.3
85	Dip	L&C Sept. 17, 1805	72.90	6200	5902	5860	133.6
102	Leaning Tree	L&C Sept. 16, 1805	82.75	6000	6160	6140	143.5
122	Peak	L&C June 27, 1806	91.90	6090	6250 *	6250	152.6
128	Lake Templin	L&C Sept. 15, 1805	95.55	5272	5312 *	5342	156.3
145	Independence Camp	L&C June 28, 1806	105.85	6145	5895	5647	166.6
166	Glade Creek	L&C Sept. 13, 1805	119.00	5219 *	5165	5140	179.7
178	Hot Spring	L&C June 29, 1806	126.00	4160 *	4150 *	4150	186.7
	L&C Sept. 12, 1805						
	L&C Sept. 11, 1805						
	L&C Sept. 9&10, 1806						
	June 30, 1806						

TABLE 8-3. Reference point name list.				
Ref. Num.	Sta.	elev	Dist.	Name
0	11	3278	77.00	Oyipe Prairie
13	12	3367	88.00	Muscle Creek
	13			
	14			
	15	4659	97.55	Cold Spring
	16	5941	100.55	Mt. Truax
40	--	5219	103.00	Pond Saddle
	17	6015	104.00	Squirrel Mt.
45	--	5345	108.50	Huston Creek
	18	5575	110.50	Butte Camp
	19	6532	112.00	First Butte
	20	6616	113.50	Second Butte
66	21	6528	125.00	Meadow Mountain
102	22	6001	140.75	Leaning Tree Camp
128	23	5272	151.50	Lake Templin
	24	6845	153.00	The Chief
	25	6145	161.25	Camp Independence
157	26	6552	165.25	Point of Rocks
161	27	4229	169.00	Clearwater Ford
	28			
167	--	5359	173.00	Takon Creek
169	29	5292	174.50	Takon Creek Camp
194	30	4016	183.00	Mullans Camp
	31			
	32	3591	203.00	Lu Lu Camp

TABLE 8-4. Index of 7.5-Minute USGS Topographic Maps - Arranged in geographic order west to east.	
Map 1.	Weippe South, 1966
Map 2.	Pierce, 1966
Map 3.	Brown Creek Ridge, 1966
Map 4.	Musselshell, 1966
Map 5.	Hemlock Butte, 1966
Map 6.	Snowy Summit, 1966
Map 7.	Weitas Butte, 1966
Map 8.	Liz Butte, 1966
Map 9.	Holly Creek, 1966
Map 10.	Lookout Peak, 1965
Map 11.	Horseshoe Lake, 1965
Map 12.	Indian Postoffice, 1966
Map 13.	Cayuse Junction, 1966
Map 14.	Rocky Point, 1964
Map 15.	Roundtop, 1964
Map 16.	Lolo Hot Springs, 1964
Map 17.	Lolo Hot Springs, 1964
Map 18.	Lolo Hot Springs, 1964
Map 19.	Lupine Creek, 1964
Map 20.	Garden Point, 1964
Map 21.	Camp Creek, 1964
Map 22.	Blue Mountain, 1964
Map 23.	Carlton Lake, 1967
Map 24.	Southwest Missoula, 1964
Map 25.	Florence, 1967

9. APPENDICES

APPENDIX A. 1992 Field Data Update (profile9.wk1).

Table A-1 presents the distance and elevation data updates to Table 7-3 for the 1992 field season. The locations that have been determined with a very high probability of correctness are marked with the * symbol.

TABLE A-1. 1992 Distance/Elevation. Determined or certain locations are marked with the * symbol.					
e:\steve \trails \lolotral \research \birdtrue \nicholsn \profile9.wk1 (Lotus)					
Ref. Num.	Reference Name	1992 Nich. Dist.	1992 Topo Dist.	1992 Nich. Elev.	1992 Topo Elev.
0	Weippe Prairie 3007				
1	Heywood Meadows 3088	0.00	0.00	3066	3060
2	inflect up	0.57	0.55	3124	3120
3	inflect up	0.85	1.05	3213	3320
4	inf down	1.22	1.35	3377	3410
5	Browns Creek Saddle 3396	1.46	1.50	3442	3445
6	dip	2.19	2.70	3194	3195
7	peak	2.47	2.85	3252	3235
8	dip	2.75	3.05	3209	3205
9	peak	3.04	3.20	3227	3220
10	dip	3.24	3.35	3174	3185
11	peak	3.73	3.45	3253	3195
12	shallow dip (Small Prairie)	5.87	6.25	3146	3140
13	Musselshell Prairie 3182	8.10	8.05	3169	3180
14	Musselshell Cr. Crossing	8.59	8.65	3174	3187*
15	infl down	8.91	9.10	3411	3395
16	shallow peak	9.07	9.35	3423	3450
17	shallow dip 3424	9.15	9.50	3384	3424
18	peak 3646	9.84	10.30	3570	3646
19	dip	10.31	10.50	3502	3590
20	inflect down	10.53	10.60	3573	3640
21	peak	10.80	10.85	3595	3690
22	small dip	10.83	10.90	3575	3660
23	peak	11.30	11.35	3659	3725
24	Siberia Creek	11.59	11.85	3453	3445
25	inflect down	11.79	12.00	3654	3680
26	peak	12.04	12.15	3755	3725
27	inflect up	12.15	12.25	3636	3680
28	Dutchman Creek	12.42	12.55	3518	3395
29	strange peak!	12.54	12.70	3570	3500
30	Lolo Forks 3389	12.87	13.15	3443	3389*
31	inflect up	13.72	13.45	3746	3740
32	inflect down 4251	14.38	14.55	4124	4251
33	Ridge Camp (Cold Spring)	17.15	17.35	4538	4871
34	inflect up	17.88	17.90	4743	4780
35	inflect down	17.99	18.15	4826	5000
36	peak	19.03	18.95	5100	5340*
37	Camp Martin 5144	19.27	19.14	5031	5144*
38	Snowy Summit	20.11	20.15	5843	6040
39	inflect down	21.34	21.25	5798	6020

40	Beaver Dam Saddle 5302	22.42	22.35	5277	5302*
41	inflect, Squirrel Mtn 5914	23.23	23.25	5939	5914
42	Squirrel Mtn. 6257	24.85	24.75	6156	6235
43	dip (runs south)	25.08	25.55	5842	5840
44	peak	25.58	25.85	6145	6140
45	Little Weitas Creek 5412	26.93	27.20	5446	5385
46	peak (near Butte Camp)	28.35	28.25	5844	5805
47	Green Saddle	29.27	29.25	5398	5420*
48	Bowl Butte 6365	30.43	30.35	6175	6365*
49	Deep Saddle 5027	31.82	31.70	5056	5027*
50	Willow Ridge 6481	32.86	32.60	6247	6200*
51	inflect down	33.51	33.50	5927	5801*
52	Sherman Saddle	34.82	34.35	4732	4737*
53	inflect down 5725	35.70	35.20	5578	5725
54	inflect down 6090	36.36	35.65	6067	6090
55	peak 6230	36.82	36.15	6195	6230
56	dip	36.90	36.25	6132	6130*
57	Ridge NE of Sherman Peak	37.48	36.90	6316	6320
58	inflect up	37.82	37.15	6010	6020
59	No-See-Um Meadows 5890	38.17	37.50	5891	5890*
60	sharp peak	38.51	38.00	6331	6270*
61	inflect up	38.71	38.55	5997	6010*
62	saddle 5894	39.02	38.90	5892	5894*
63	inflect up	39.44	39.40	5980	6050
64	sharp peak	39.67	39.70	6122	6130
65	Saddle	40.02	40.25	5876	5860
66	Bald Mountain	41.29	41.85	6161	6300
67	saddle 5782	42.21	42.70	5782	5782*
68	inflect down 6066	42.83	43.40	6051	6066
69	inflect down	43.33	43.60	6212	6220
70	small peak 6276	44.29	44.05	6247	6276
71	small dip	44.95	44.25	6189	6180
72	inflect level	45.46	45.15	6536	6500
73	inflect up	45.81	45.45	6531	6500
74	inflect level 6555	45.94	45.60	6569	6555
75	inflect down 6554	46.24	46.00	6563	6554
76	Saddle	46.37	46.35	6358	6340
77	Castle Rock 6592	47.18	47.10	6537	6592
78	saddle	47.44	47.40	6342	6370*
79	Smoking Place 6574	47.87	47.75	6517	6574
80	inflect up	48.13	48.00	6349	6410
81	Indian Grave Camp	48.65	48.60	6244	6280*
82	small peak	48.90	48.75	6332	6370
83	Sinque Hole	49.08	49.20	6035	5980
84	peak 6279	49.76	49.70	6248	6279
85	Saddle	50.19	49.95	5924	5870*
86	peak 6099	50.45	50.20	6090	6099
87	inflect down	50.88	50.65	5895	5860
88	inflect up 5634	51.05	51.20	5611	5634
89	Serpent Creek (Snow Bridge) Gu	52.52	52.70	4543	4570
89	Serpent Creek (Snow Bridge) Gu	52.52	52.70	4543	4570
90	inflect down	53.85	54.60	6234	6240
91	Moccasin Peak (at saddle)	54.67	55.20	6410	6390
92	Howard Camp (Meadow)	55.01	55.80	6067	6090
93	peak 6308	55.53	56.10	6309	6308
94	saddle between	55.87	56.30	6231	6230
95	peak 6635	56.34	56.70	6595	6635
96	saddle	56.56	56.90	6487	6490
97	peak 6658	56.95	57.05	6599	6658
98	saddle 6441	57.33	57.70	6445	6441*
99	inflect down	57.63	57.90	6648	6620
100	peak 6773	57.81	58.15	6700	6673
101	Moon Saddle	58.41	58.65	6125	6100

102	Leaning Tree Camp	58.67	58.75	6176	6140
103	peak 6575	58.92	59.00	6498	6520
104	dip	59.14	59.20	6450	6420
105	peak 6530	59.35	59.40	6502	6530
106	dip	59.78	59.75	6446	6460
107	inflect down	60.34	60.35	6742	6750
108	inflect level	61.20	60.90	7001	7005
109	Indian P.O. Peak 7033	61.50	61.20	7000	6990
110	dip	61.89	61.70	6809	6810
111	peak 7004	62.32	62.00	6969	6960
112	dip	62.49	62.25	6788	6780
113	peak	62.88	62.75	6907	6890
114	dip 6782	63.22	62.90	6777	6782
115	peak 6932	63.52	63.30	6916	6932
116	inflect up	63.70	63.70	6635	6600
117	inflect down	64.34	64.15	6425	6400
118	inflect up	64.81	64.60	6116	6090
119	dip	65.24	65.00	6088	6090
120	peak	65.46	65.40	6210	6250
121	dip	65.85	65.65	6154	6170
122	Spring Mtn 6306	66.53	66.05	6235	6306
123	inflect up	66.75	66.40	6100	6100
124	saddle	67.31	66.80	5872	5860
125	inflect level 6034	67.48	67.00	6018	6034
126	inflect up	68.00	67.45	6005	5980
127	peak 6252	68.38	67.80	6172	6252
128	Cayuse Junction 5342	69.67	69.50	5350	5342*
129	inflect up	70.49	70.40	5960	6050
130	inflect down	71.18	71.20	6764	6810
131	The Chief (Mt. Marcy)	71.82	71.45	6884	6890
132	saddle	72.34	72.05	6426	6430*
133	inflect down	72.55	72.25	6587	6650
134	peak 6879	72.98	72.50	6738	6800
135	Saddle	73.37	72.80	6630	6660
136	peak 6934	73.80	73.15	6781	6880
137	slight dip	74.32	73.65	6743	6770
138	slight peak 6882	75.01	74.40	6798	6835
139	Saddle	75.44	74.80	6740	6740
140	peak	75.74	75.10	6792	6800
141	Saddle	76.51	75.80	6635	6620
142	sharp peak 6888	76.73	76.12	6756	6820*
143	inflect up (at saddle)	77.07	76.72	6343	6350*
144	inflect level	77.80	77.47	6137	6140*
145	inflect down	78.19	77.92	6135	6140*
146	Papoose Saddle	78.53	78.32	5671	5647*
147	inflect level 6130	78.83	78.82	6088	6130
148	inflect down	79.09	79.07	6086	6125
149	Saddle 5872, Powell Jct. Road	79.26	79.32	5894	5872
150	inflect level	79.61	79.82	5971	5970
151	inflect down	79.95	80.37	5956	5930
152	Saddle 5466	80.47	81.02	5452	5466*
153	peak	80.77	81.32	5610	5590
154	dip	80.90	81.37	5560	5500
155	inflect down	81.20	81.72	5778	5790
156	inflect up	81.46	82.12	5875	5860
157	Rocky Point 6280	81.84	82.37	6275	6280*
158	inflect up	82.06	82.67	5930	5940
159	inflect level	82.23	82.82	5839	5840
160	curve down 5785	83.05	83.62	5814	5785
161	Crooked Fork Crossing	85.54	85.62	3929	3970*
162	inflect up	86.40	86.37	4845	4830
163	inflect down	86.74	86.77	5371	5370
164	inflect up	87.30	87.42	5502	5500

165	inflect level	87.52	87.67	5642	5645
166	inflect down 5661	87.86	87.92	5642	5640
167	Pack Creek	89.15	89.32	5163	5140
168	L&C Glade Creek Camp	89.28	89.92	5174	5185
169	Pack Creek (N5292)	90.52	90.82	5240	5199
170	Lolo Pass (circa 1912)	91.45	91.42	5260	5254*
171	dip (West Fork Lolo Cr.)	91.76	91.67	5211	5190
172	inflect down	92.23	92.37	5393	5410
173	Wagon Mountain	93.16	92.77	5554	5570
174	inflect down	94.24	93.67	5327	5340
175	inflect down	94.86	94.37	4962	5160
176	West Fork Lolo Creek	95.48	95.42	4253	4241
177	peak	96.49	96.02	4495	4600
178	inflect up	96.53	96.92	4258	4235
179	inflect level	97.13	97.27	4128	4160
180	Lolo Hot Springs	97.50	97.67	4129	4150*
181	inflect down	97.65	97.82	4280	4300
182	peak	97.99	98.02	4310	4330
183	Granite Creek	98.29	98.17	4121	4140
184	L&C Camp 09/12/05	98.97	98.52	4213	4230
185	peak	99.53	98.97	4253	4270
186	2 Fords of Lolo Creek	100.50	100.47	4076	4045*
187	inflect up steeply 4034	100.73	100.47	4077	4040
188	inflect down	101.21	101.17	4889	4900
189	inflect level	101.85	101.82	5131	5160
190	inflect up	102.26	102.37	5143	5180
191	peak	102.53	102.82	5224	5240
192	dip	102.94	103.22	4795	4800
193	peak	103.28	103.62	4836	4840
194	inflect down	104.14	104.77	4490	4500
195	Howard Cr. 3851 (Mullans Camp)	104.93	105.77	4009	3851*
196	peak	105.38	106.22	3942	3945
197	dip (creek from North)	106.01	106.87	3872	3875
198	peak	106.28	107.02	3932	3935
199	Hungry Creek (inflect up)	106.76	107.32	3832	3835
200	Grave Creek	107.40	108.07	3792	3788*
201	peak	107.70	108.37	4052	4050
202	dip	108.04	108.57	3942	3945
203	peak	108.19	108.82	4052	4055
204	dip	108.38	108.97	4012	4015
205	inflect level	108.53	109.07	4102	4105
206	inflect down	108.79	109.37	4102	4105
207	Clark Creek	109.24	109.47	3942	3945
208	peak	109.65	109.92	4232	4250
209	Potato Gulch	110.14	110.37	4092	4095
210	peak	110.29	110.67	4222	4225
211	Sheldon Creek	110.66	111.17	4062	4065
212	peak	111.15	111.67	4142	4175
213	Smith Creek	111.38	112.07	4102	4105
214	peak	111.90	112.27	4172	4175
215	Bear Creek	112.20	112.72	3766	3760*
216	peak	112.50	113.07	4015	4100
217	Camp Creek	113.03	113.32	3844	3840
218	inflect up	113.59	113.52	3942	3910
219	peak	113.70	113.62	4011	3980
220	dip	114.08	113.77	3920	3920
221	peak	114.23	113.92	3989	4020
222	Woodman Creek 3542	115.08	115.02	3584	3580*
223	L&C Camp? 11/11/05	117.14	117.02	3502	3460
224	inflect down	119.51	119.42	3392	3390
225	inflect up 3356	120.23	120.17	3299	3356
226	Elev. Ref.	123.32	123.17	3274	3230
227	L&C Camp? 6/30/06	124.35	124.17	3249	3200

228	Bitter Root River	125.53	125.87	3160	3155
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